ELECTRICAL REVIEW

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VIEWS, NEWS AND INTERVIEWS.

The Engineers' Club, of Philadelphia, requires from applicants for membership a brief statement of the professional work they have done. A recent application contained the following terse and modest statement of facts:

"I have designed a concentrating plant and built a machine shop, etc., etc.—Thomas A. Edison."

Electrical men and others know something of what the "etc., etc." stands for.

Besides its municipal electric lighting system, including 1,460 arc lamps, there are said to be over 400 electric lighting plants in Chicago.

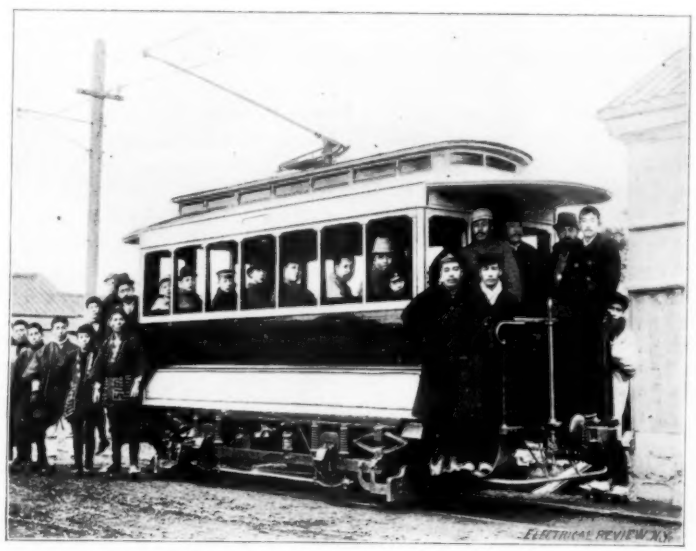
A prominent wire and cable manufacturer of New York city has on his desk a sample cable about a foot long and one and one-half inches in diameter. The cable is armored with heavy galvanized iron wire, and this one foot weighs probably five or six pounds. A visitor to the office asked what such cable was used for, and the gentleman to whom he was speaking promptly replied that it was a sample of several miles of cable supplied to the government for telephonic communication between the ground and the war balloon at Fort Slocum. The visitor swallowed the yarn complacently, not thinking, apparently, of the great weight of the cable.

The Brooklyn Heights Railroad Company has decided to erect a mammoth storage building at Myrtle and Gates avenues, Brooklyn, N. Y., at a cost of $150,000. It will cover an entire block, and will have accommodations for housing over 600 trolley cars.

Major J. O. Kerbey, a formerly well known telegrapher, connected with the Associated Press in Pittsburgh, has offered his services to the United States Government as a secret service agent. The offer has been accepted. Major Kerbey served in the Civil War with the signal corps under General Custer and has a thorough knowledge of both the signal and cable codes. He expects, under his rank of major in the signal corps, U. S. A., to be sent to Martinique, Jamaica, or some island in that vicinity. He has a thorough knowledge of the Spanish language and is an immune from yellow fever.

The services of dynamite have had to be requisitioned to separate parts of the cable machinery in the power-house of the Capital Traction Company, Washington, D. C., which was destroyed by fire some months ago, says an exchange. Attempts to separate the hubs of some of the large wheels from their shafts proved fruitless, and as a last resort they were blown off. Notwithstanding the fact that precautions were taken to prevent accident, portions of the wheel were blown a considerable distance, but, fortunately, no one was injured.

General Greeley, chief of the signal corps of the army, reported last week that the telegraphic, telephonic and signal systems between the ports on the Atlantic coast are now in good working order, and that the government is in a position to quickly send word to the big cities of the discovery of an enemy off any portion of the Atlantic coast. General Greeley says that the rapid communication systems are complete at all ports north of Fort Caswell, and include the important cities of New York, Boston, Philadelphia and Washington. The chief of the signal corps has advocated the establishment of these improvements for many years past, and he is now much gratified that the government has carried out his recommendations. He says that it will improve our general system of coast defenses fully 25 per cent, as the officers commanding the coast batteries are now in constant touch with each other and are able to co-operate in any move to repel an enemy.



AN ELECTRIC RAILWAY CAR IN KIOTO, JAPAN.

President John L. Heins, of the Coney Island & Brooklyn Street Railway, received on Saturday last a particularly handsome car for the use of the officials inspecting the road. It is probably the finest parlor street car ever turned out by the great car works of the Brill company, of Philadelphia, and will undoubtedly be the cause of much envy on the part of other street railway officials in the Borough of Brooklyn.

Edmund Willard Foote, one of the twin sons of electrician George Foote, of Brooklyn, N. Y., has won the West Point cadetship at the disposal of Congressman Driggs, of the Third district.

ELECTRICAL PROGRESS IN JAPAN.

THE ELECTRIC RAILWAY IN KIOTO.

Barely 30 years ago, Japan was a country little known to Europeans, and upon which the civilization of the West had made no impression. Suddenly flung open to commercial intercourse with America and Europe, Japan has shown an adaptability and receptiveness which have no parallel in history, whether modern or ancient. Not two years ago she conducted a war upon principles imbibed from European intercourse, and emerged triumphant. To-day the seat of war has been changed to the commercial field, and it is not improbable that, coming into competition with her western neighbors, Japan may prove an influence which will leave a deep impress upon the commercial history of the world.

Among the many excellent things which the island country has adopted, by no means the least is electricity. The earliest electric lighting plant, an Edison plant, was installed in 1888, in the palace of the Mikado at Tokyo. It is by means of electricity that the value of one of the most remarkable feats in modern engineering was measurably enhanced, and the inhabitants of Kioto, the former sacred city of the Mikado, now read their daily newspapers by the light of the incandescent and arc lamps, and ride through its streets on trolley cars.

The operation of a system of electric street railways in Kioto is the culmination of the great engineering work just referred to—the utilization of the waters of Lake Biwa. This work has excited the interest of engineers the world over.

Lake Biwa, with a superficial area of 500 square miles, in the shape of the Japanese harp—"Biwa"—lies some six miles from Kioto, beyond two ranges of hills, the larger known as the Nagarayama, the smaller as Hinooka-yama. Through Kioto runs a waterway, known as the Kamogawa, by which boats can pass through the city to tide water at Osaka Bay. Lake Biwa lies 150 feet above Kamogawa, and the junction of the two seemed so naturally destined that so

far back as the twelfth century projects for bringing the upper waters to the lower were presented; but not until the conservatism of old Japan with its duplicate emperors and its feudal system were abolished could the project receive that consideration which the necessity of assimilating European ideas compelled.

In 1882, 11 years only after the abolition of feudalism, Mr. S. Tanabe, a student in the engineering section of the Imperial University, selected as the subject of his graduating thesis the construction of canals joining Lake Biwa to Kioto. The subject was very thoroughly treated—the depth of the canal was laid out sufficient to float the boats on Biwa and fall sufficient to allow of the utilization of the water at Kioto for power, as well as for irrigation, fire and sanitary purposes.

This thesis excited the attention of the government. The proposal came at a very opportune moment, and the work was undertaken in 1885 and carried out on the lines laid down by Mr. Tanabe. It was concluded in 1890.

The canal has a total length of six and seven-eighth miles, and is divided into two sections. The longer is five and one-quarter miles long, and carries the waters of Biwa through the hills to the suburbs of the town. The shorter is one and five-eighth miles long and connects the suburbs to the center of the city, where it connects with the Kamogawa waterway.

The first part of the canal runs from the lake to the Nagarayama hills, a distance of 600 yards. Through these it passes in a tunnel 2,680 yards long, and continues in the open another 4,837 yards to the Hina-okayama: Through this range it passes in tunnels 137 yards and 934 yards, respectively, until it reaches the head of the incline.

The constant flow in the canal, available for power and irrigation, is 300 cubic feet of water per second, of which 250 cubic feet is devoted to power purposes, while 50 cubic feet is diverted into another canal for irrigation purposes.

Between the canals is a difference in level of 150 feet. As first laid out locks were to be employed, but this plan was changed and an inclined plane railroad substituted. This is 1,800 feet long, with a gradient of one in 15. This railroad is operated by means of a cable, having a cradle car at each end. When a boat is to be sent down from Biwa to Kamogawa, it is slid on the cradle and dropped down to the lower canal. Here it is poled off and the cradle car is then ready to receive another boat for elevation to the upper canal and the waters of the lake. When the cars are started—i. e., one from the lower canal and the other up the short reverse incline at the top—the 50-horse-power motor operating the cable is fully loaded, but when the car reaches the main incline the boats are balanced and the load on the motor reduced to five horse-power.

At the time the canal was projected the possibility of utilizing the power, which the difference in level would give, was confined to the employment of water-wheels. Before the conclusion of the work, however, the experiments in power transmission by electricity, made in America and Europe, had aroused attention in Japan, and the use of electricity was decided upon if the reports of Messrs. Tanabe and Takagi, who were sent over to study the question, should turn out satisfactory. The report proving excellent, very complete electrical equipment was ordered from America. This water-power electrical transmission, completed in 1891, was not only the first in Japan, but also one of the first of the notable ones in the world.

The pipe line consists of three pipes, each 35½ inches in diameter and 1,376 feet long. The power-house is not placed at the foot of the incline, but some 400 feet from the bottom, in a large pit excavated for the purpose. The water-wheels are of Pelton manufacture, and there are now 20 in the station, placed in rows on each side of the tail race, which runs through the center. These wheels are of 120 horse-power each, under a head of 100 feet, and are eight feet in diameter. They are controlled by ball governors and deflecting Pelton nozzles. In addition to the 2,400 horse-power in the Pelton wheels, 600 horse-power more is available in the length of Kamogawa. This has five locks, at each of which a 120-horse-power turbine will be located, when the demand for power warrants the extension.

The station is built in steps, the wheels occupying the lowermost, the countershafts the intermediate ones, and the dynamos the top. The wheels are belted to the countershafts, and these in turn are belted to the generators.

The electrical equipment, first started in July, 1891, with two Edison, 80-kilowatt, 500-volt machines, now consists of a number of generators giving current as follows:

435 kilowatts, direct-current, at 500 volts.

250 kilowatts, single-phase alternating current, at 1,000 and 2,000 volts.

240 kilowatts, two-phase alternating current, at 2,000 volts.

240 kilowatts, three-phase alternating current, at 2,000 volts.

The Kioto Canal Power Company or the Sui-Ri-Jiniusho operate the power, transmission and distribution. Previous to the completion of the work, the Kioto Electric Light Company had started a three-wire electric lighting installation, with four Edison dynamos. The authorities having decided that the Power company should control the distribution of the current for power purposes, and the Electric Light company that for lighting purposes, the former arranged to install the single-phase alternators in its station.

The Canal Power Company is now furnishing current to 1,000 horse-power in motors operating cotton mills, etc., and is engaged on the installation of some 700 horse-power additional. Its latest development is the establishment of an electric street-railway system in Kioto. This is a trolley system on purely American lines. The service is carried out by 26 cars, each equipped with two General Electric 800 motors and K2 controllers. The overhead system is carried in places on span wires; in others on brackets. The rails are of American manufacture, bonded with Chicago rail bonds.

TELEPHONE NEWS AND COMMENT.

The New England Telephone Company has reduced the rates for night messages to one-half the day rate, no message, however, to be less than 15 cents.

The Mexican Telephone Company has 2,486 telephones in service. Rentals for the year 1897–8 amounted to $121,513; net earnings in Mexico, $47,571.

The Cumberland Bell Telephone Company is putting in a new service board in the exchange at Culleoka, Tenn., the old one being too small to accommodate the new subscribers.

The Western Union Telegraph Company is handling some 3,000 more messages per day in its Boston office than it did for the corresponding time last year. Business in the Portland offices has also increased in a like proportion.

The Colorado Telephone Company was damaged to the extent of about $12,000 by a snow-storm the first of the month of May. The damage in Denver alone was nearly $9,000. General Manager Field has rapidly put things to rights.

The New York & New Jersey Telephone Company has purchased a building for its Plainfield, N. J., exchange. This company owns a number of buildings in the different cities of its territory specially adapted for telephone exchange service.

The Empire State Telephone Company, Auburn, N. Y., which two years ago put its line through from Seneca Falls to Ovid, is now preparing to extend southward to Trumansburg, where they will connect with the line from Ithaca. All of the villages and hamlets in the southern part of the county are to be connected with the outside world.

Chin On, a Chinaman, has commenced damage suit against the Sunset Telephone and Telegraph Company in the sum of $3,000. He avers that the defendant negligently left a wire suspended at a distance of about four feet from the ground, and the plaintiff, unwarned, ran into same and was injured in the sum mentioned. This is the first Chinaman that has ever sued the company.

A special telephone exchange has been established at State military rendezvous at Niantic by the Southern New England Telephone Company, and will be maintained as long as troops remain encamped. Arrangements have been made for a messenger service in connection with the exchange, so that soldiers may be sent for in the usual way and placed in communication with their friends.

Holidaysburg, Pa., recently adopted an ordinance which places a yearly tax on all electric light, electric and steam railway, telegraph and telephone poles, each pole on the public streets to be taxed $1, and each pole in the alleys 75 cents yearly, the money from these taxes to be used for keeping up the streets and to defray expenses of police protection. The ordinance was offered by Councilman Joseph Condron, who was elected on that issue. Burgess Van Allman also announced that the borough ordinance regarding poles of telephone companies, electric light companies and street railway companies would be rigidly enforced.

THE ELECTRIC LIGHT CONVENTION.

TWENTY-FIRST MEETING OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION TO BE HELD AT THE AUDITORIUM HOTEL, CHICAGO, JUNE 7–9—THE PRELIMINARY PROGRAMME—RAILROAD ARRANGEMENTS.

Everything is in readiness for the meeting of the National Electric Light Association at the Auditorium Hotel, Chicago, June 7, 8 and 9. The local committees have perfected their arrangements, and the work of President Insull, Vice-president Young, Secretary Porter and Master of Transportation Baker is about finished. Mr. Baker has issued the following letter of information regarding the railroad arrangements:

TO THE EDITOR OF ELECTRICAL REVIEW:

The Trunk Line Association, Central Traffic Association, New England Passenger Association, Southern Passenger Association and the Western Passenger Association have granted a rate of a fare and one-third, on the certificate plan, from all points in their territory to Chicago and return for delegates attending the twenty-first convention of the National Electric Light Association, to be held June 7, 8, 9; convention hall and headquarters at the Auditorium Hotel. Rates: $3.50 to $5 per day on the American plan; $2 to $4 per day, for each person, on the European plan. Yours very truly,

C. O. BAKER, JR.,
Master of Transportation.

New York, May 10.

The programme for the first two days of the twenty-first convention is as follows:

"Cost of the Generation and Distribution of a Unit of Electricity," by Calvin W. Rice, Borough of Brooklyn, New York.

"General Distribution from Central Stations by Alternating Currents," by Herbert A. Wagner, St. Louis, Mo.

"General Distribution from Central Stations by Direct Currents," by Louis A. Ferguson, Chicago, Ill.

"Public Lighting with Relation to Public Ownership or Control," by Alexander Dow, Detroit, Mich.

"Transformer Economy," by W. E. Goldsborough, Professor of Electrical Engineering, Purdue University, Lafayette, Ind.

Topics for Discussion—"Legislative Policy as to Public Service Corporations;" "Prices and Discounts for Electric Current, and Methods of Charging Customers;" "Standardizing Apparatus for Central Station Use;" "Standardizing Specifications for Incandescent Lamps;" "Freight Rates on Electrical Apparatus."

Lecture—"Electricity Direct from Coal," by Joseph Wetzler.

The third day's programme will be announced at an early date.

What a Little Girl Saw at the Electrical Show.

The ELECTRICAL REVIEW has received from a little girl, 12 years old, the following account of what she saw one evening last week at the electrical show in Madison Square Garden, New York city:

As you enter Madison Square Garden and look around, the first thing to attract your attention are the words "ELECTRICAL REVIEW" printed in electric lights at the left side of the balcony.

Soon after our arrival at 8.30 P. M. the "Maine" was blown up by a submarine mine. It was very crowded around the tank, every one trying to get as near as possible until it was blown up and the water flew in every direction, then they tried to get as far away as possible.

And next in importance to the ELECTRICAL REVIEW are the baking powder biscuits cooked on the electric stove. The towels and napkins that the colored girl ironed with the electric iron looked very smooth and pretty.

Edison's exhibit was very interesting, to see how the ore was separated from the sand. Thomas Edison, Jr., also gave an exhibit of different colored lights.

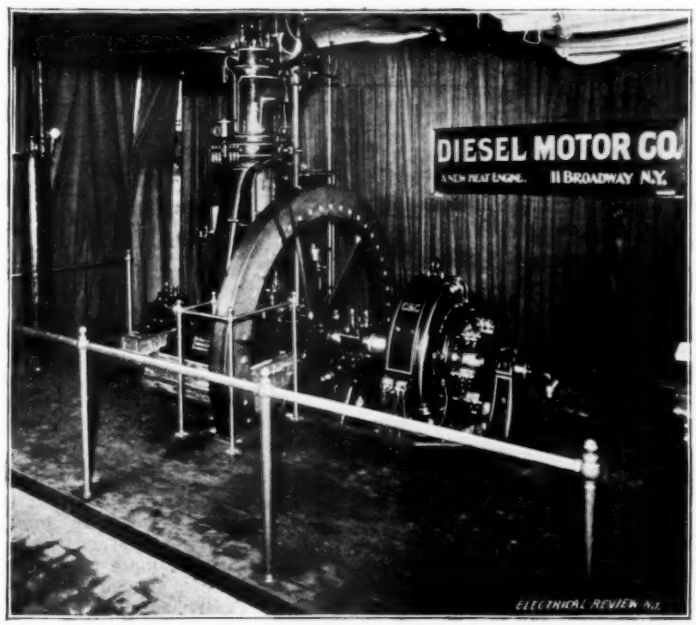
The local and long-distance telephone gave an exhibit of a diver's suit with telephone attachment showing how the diver could communicate with those on land. The Electric Vehicle Company exhibited two or three horseless carriages.

The Telegraph Tournament at the Electrical Exposition.

There were many famous old-time telegraphers at the electrical show last Saturday night, attending the telegraph tournament. Among them were Thomas A. Edison, A. B. Chandler, Jesse H. Bunnell, W. H. Baker, A. S. Brown, E. W. H. Cogley, F. W. Jones.

Mr. Fred Catlin was the manager of the tournament, assisted by Messrs. Thomas J. Smith, A. E. Sink and J. B. Taltavall.

W. M. Gibson, of this city, won the world's championship for sending telegraph messages. He broke all records by sending 254 words over the wires in five minutes.



THE DIESEL MOTOR—DIRECT-CONNECTED TO C & C MOTOR, AT THE ELECTRICAL EXPOSITION, NEW YORK.

The contest was close, for some of the best telegraph operators of the country took part. Frank L. Catlin, of Albany, won the second prize, sending 253½ words, and J. D. Hinnent, of this city, was third, with 248 words.

When Mr. Gibson had concluded his message he was greeted with a storm of applause. Mr. Edison shook hands with the new champion and told him that he was a wonderful telegrapher.

The code-sending contest, which was held before the championship was decided upon, was won by G. W. Conkling, of the Laffan News Bureau, this city. He sent 345 words in five minutes, the fastest time on record.

In the ladies' class, for sending the greatest number of words in five minutes, Miss J. McManus, employed by the Postal Telegraph Company, New York, won the first prize; Miss Emma R. Vanselow, Commercial News Department, New York, second prize.

The Diesel Motor Company's Exhibit at the Electrical Exposition.

We present on this page an illustration reproduced from a photograph of the exhibit of the Diesel Motor Company, of America, at the Electrical Exposition, New York city. The cut shows a 20-horse power Diesel motor coupled directly by a rigid coupling to the armature shaft of a C & C generator. The motor was not built for electrical work, but is an ordinary 20-horse-power stationary motor intended to run machinery by belt drive. It runs at only 170 revolutions per minute, is a single-cylinder motor, and, like all internal combustion motors, works on the four-stroke cycle. Time was not available to change the gearing for higher speed, desirable as that appeared, for electrical work. It seemed, therefore, a bold undertaking to attempt to make it drive an electric light generator. But public interest in the Diesel motor has been so aroused, and the opportunity to exhibit it at the Electrical Exposition seemed so favorable, and above all, the directors of the company have such absolute faith in the motor, that they determined to exhibit it even under these adverse conditions. Delays in shipment and in the custom house, reduced the time for preparation. The only change that could be made in the time available was to supply the engine with a somewhat heavier flywheel than necessary for its ordinary work, and, after two days of preparatory run, it was set up in the exposition, and carries its load of lights with less than one and one-half per cent variation. It requires less than a minute to start the engine when perfectly cold, and within two minutes it is running at full speed with its dynamo. We believe that this is the first instance on record that a single-cylinder, internal-combustion engine has ever accomplished these results. Those who have studied the working of the Diesel motor find the reason for this success in its controlled and perfect combustion and the absence of any explosive action.

The managers of the Alley L Road, of Chicago, which is now installing the Sprague multiple-unit system, report that as soon as the steam trains are off the line they will be able to reduce their schedule from 38 to 30 minutes, and that they will save in transportation wages alone more than the total depreciation, and will make the old steam service mileage with 15 per cent fewer cars. They also report that the strains on their structure are noticeably reduced, and that the increase in their traffic has already added quite a percentage to their receipts.

INSULATION AND CONDUCTION.

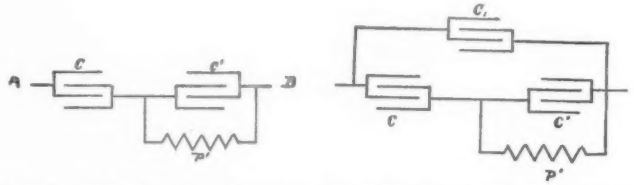
READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NEW YORK, MARCH 23, 1898, BY REGINALD A. FESSENDEN.

(*Continued from page 301.*)

For insulating the coils of resistance it is doubtful if we have any good solid material. For paraffin can not be used, as its expansion and contraction are so great that large pressures are put upon the wire and the resultant strains change the resistance. It might be easy enough to prevent the strain on the first solidification in a way similar to that devised by Rowland for cementing flat mirrors without buckling them; i. e., by mixing a little glycerine with the beeswax; the glycerine not dissolving in the beeswax makes it act like a viscous fluid; i. e., deform under the action of infinitesimal forces in time. The glycerine, however, finally works its way out like zinc in a resistance alloy (as first pointed out by Mr. Weston), and if a similar method were used with the coils, it would still be subjected to strains on change of temperature. Another objection which has been made in England is that paraffin absorbs moisture. It is possible that this is due to the dissimilar methods of producing American and English paraffin, as I have never had to complain of this, except, of course, when cold paraffin was placed in saturated moist air. The insulation resistance of paraffin seems, however, to be markedly increased by the treatment mentioned below. The great objection to paraffin is its tendency to collect dust. Shellac has been recommended, and since the coils are in the dark the material will oxidize but slowly, and if care be taken to use pure alcohol for a solvent, and not denaturized spirit (which sometimes contain conducting impurities), has a very high resistance when dry. Some forms of Japan lac seem to remain flexible permanently, as, for instance, the sample *a* (composition unknown) which is 10 years old.

Oil is sometimes used for resistance coils, and this is without doubt the best method, since the great point in the use of resistance coils is to know their temperature. The writer's experience with manganin and constantin as practical laboratory standards has been unfortunate, and he has hence decided to use only standards of pure lead run into glass tubes and kept in water. The reason is that, other things being equal, the most sensitive Wheatstone bridge is that which takes the greatest current without appreciable heating, and in the ordinary form of resistance coil a very small current will heat the interior up to such a temperature as to alter the value. Moreover, if the coil is of a material not affected by such changes of temperature, it (with our present alloys) will have a larger temperature coefficient, and as the temperature of the interior of the coil is not known, this introduces another uncertainty. With the oil mounting, however, this is all done away with, and pure oil has a very high resistance for low voltages.

For condensers and induction coils it is not only necessary to have materials of great ohmic resistance and of great dielectric strength, they must also be perfectly pure and free from admixture. For the first two properties there is nothing so good as paraffin, when properly used, all compositions, such as beeswax, cerotic acid, etc., being quite inferior in both respects. Paraffin, and what is practically the same thing—pure ozokerite—will stand, according to the tests of Mr. Chesney, which I had the pleasure of witnessing, at the rate of 500,000 volts per inch. This I have confirmed up to 60,000 volts, alternating. Most substances, such for instance as glass, are at once cut out from consideration from the fact they have too much electrical absorption, and heat when subjected to a fluctuating voltage.



FIGS. 7 AND 8.—DIAGRAMS ILLUSTRATING "INSULATION AND CONDUCTION."

We must have an electrically homogenous dielectric; i. e., one of the same specific inductive capacity all through. This is for two reasons. First, because if we have a dielectric A between two charged conductors, the introduction of a dielectric of greater specific inductive capacity, even if of infinite dielectric strength and ohmic resistance, will cause A to break down. To take a numerical case: Suppose we have two plates, one centimetre apart, and attached to the terminals of a 10,000-volt alternating-current dynamo (Fig. 5). Suppose the dielectric, air, to support 50 per cent more than this pressure. Introduce two plates of glass of K=8, each one-quarter centimetre in thickness. Since the voltage divides itself up inversely to the capacitance, we will now have 8,889 volts between C and D. This being at a rate of 17,778 volts per centimetre, and as it only supports 15,000, we will get a spark between C and D at every reversal of the voltage, which will quickly heat the glass and make it conduct. The full potential of 10,000 will then be between C and D, and a regular arc will form. Thus we see that the introduction of a good insulator will, in all cases where an intermittent or alternating voltage is used, have the paradoxical effect of weakening the insulation, unless the whole space is filled up with the material. This weakening is not generally apparent at once, as the spark takes some time to eat its way back, and this explains why many induction coils only last for a few years of operation.

Another cause is that treated of by Poisson, Clausius and Maxwell.* This is, that layers of dielectrics of different capacities and resistances show electrical absorption, and this theory has been proven experimentally by Muraoka, who showed that by taking two fluids, neither of which showed absorption, a layer of one on top of the other did do so. Maxwell treated the general case. It has, however, been treated in a more specialized way by a writer in *La Lumiere Elec.*, in 1891. In this paper are brought out the following points:

The experiments referred to of Liebenow and Strasser are a series of elaborate investigations on a number of alkaline thermo-electric cells, the results of which are entirely in accord with the explanation given above, and form the basis on which that explanation is chiefly founded. I am unable to agree with those investigators, as before stated, in some of their conclusions; as, for instance, the conclusion that electrical energy or any other form of energy can be evolved from the "passivity" of a metal or from any other property of matter, and I believe the experiments they have described do more towards disproving their own preconceived theory than any experimental work that has been done relating to this subject.

In those experiments the effects produced by various alterations of the electrolyte on the potential difference between various electrodes and an arbitrary "normal electrode" were determined. Simultaneous measurements of electro-motive force and temperature were made which throw much light upon the nature of these cells. Unfortunately no measurements were made to determine at the same time the difference of temperature between the various electrodes.

The relation between the temperature of the electrolyte and the electro-motive force of the carbon-caustic-potash cell, as indicated by the results of Liebenow and Strasser, is well illustrated in the curves shown in Fig. 5. In this diagram the abscissa represents the time measured from the beginning of the experiment, and the corresponding ordinate of the dotted line represents the temperature, while the ordinate of the full line represents the simultaneous difference of potential between the carbon rod and the "normal electrode." Liebenow and Strasser apparently failed to see the relation between the curves of temperature and electro-motive force, simply because the direction of this electro-motive force happened to be opposite to that which they had been arbitrarily measuring as increasing towards the top of the diagram. They, therefore, measured electro-motive force downwards and the corresponding temperatures upwards and obtained the diagram shown in Fig. 6, which is not quite so easily interpreted. They apparently failed to get any meaning from it, merely remarking that it did not agree with the formula they had empirically deduced.

When the intensity of the electro-motive force is compared directly with the temperature instead of inversely, the relation becomes apparent, as shown in Fig. 5. In this particular case the diagram shows decidedly that the electro-motive force increases and decreases with the temperature of the electrolyte. From the nature and arrangement of the apparatus we know that the difference of temperature between the electrolyte and the rod will also increase and decrease with the temperature of the electrolyte. This dependence of electro-motive force upon difference of temperature is shown in nearly all the diagrams of Liebenow and Strasser, when the electro-motive force, whether positive or negative, is measured in the same direction as the temperature. And it must be so measured in order to make a direct comparison. The polarity or direction of the electro-motive force has no particular bearing on the relation between its intensity and variations in temperature, but is dependent merely on the accidental position of the neutral point on the thermo-electric diagram.

(*To be continued.*)

* "Electricity and Magnetism," vol. 1, chapter x.

Wireless Submarine Telegraphy.

Some interesting experiments were recently made off the shore of Staten Island, under the auspices of the *World*, of this city, which enterprising daily was testing the ideas of Mr. C. E. Dolbear, of Boston, son of Prof. A. E. Dolbear, of Tufts College. Telegraphic signals were sent from the shore to the boat, some 1,500 feet away, and were received on a telephone receiver. The two sets of wires were grounded, by means of copper plates on the shore line, and on the boat one end was attached to a copper plate thrown over the stern of the boat, the other end of the wire attached to the condensing apparatus of the boat. The telegraphic signals from the shore were heard quite distinctly on board the boat by means of the telephone receiver. Mr. Dolbear is quite enthusiastic in his work in this line, and it certainly has much promise of practical value.

Patent Rights in China.

Under date of February 5, 1898, Minister Denby sends from Peking the following copy of a letter to a correspondent asking for information in regard to patents in China:

EXHIBITS OF THE FOSTORIA INCANDESCENT LAMP COMPANY AND THE CROUSE-TREMAINE CARBON COMPANY AT THE ELECTRICAL SHOW, NEW YORK CITY.

LEGATION OF THE UNITED STATES,
PEKING, February 5, 1898.

DEAR SIR: I have received your letter of December 20, wherein you ask me to advise you as to what would be necessary in order to file or record a railroad device in the patent office of China.

In answer thereto, I have to state that there is no patent office in China. There is no prohibition against the introduction of patented articles in this country.

With regard to copyright, trade-marks and patents, there are no treaties between the United States and China. Should disputes relating thereto arise between American citizens in China, they would be tried before the American consuls and decided according to the law of the United States. A patent held valid in the United States would be so held in China in all cases in which Americans are interested.

With regard to native Chinese, they stand in all these matters in the same relation to American citizens as the inhabitants of any foreign country. The international recognition of rights to patents, trade-marks, etc., depends entirely on treaties. In the absence of such treaties, there is nothing to prevent American books being reprinted, American trade-marks copied, and native produce sold under them and American patented goods reproduced by native workmen. The native laws, however, give remedies for fraudulent representation or obtaining money under false pretenses. I have, on several occasions, applied to the Chinese Government to furnish protection against the fraudulent use of American trade-marks. In each case energetic action has been taken by the local magistrates, and the perpetrators of the frauds have been punished and damages assessed.

Beyond such preventive action, I do not see how, under existing treaties and laws, the government of China can do anything.

As between Americans and foreigners, these rights in China would depend on any treaties which the respective governments may have entered into regulating the protection to be afforded by their respective countries.

There is no objection to your selling to any railroad company the right to use your patent. Should the patent be afterwards used by any other person without the right having been granted by you, you should appeal to your consul for redress. He would, if necessary, bring the matter to the attention of the legation.

New York Electrical Society.

A meeting of the New York Electrical Society was held in the concert hall at Madison Square Garden last Thursday evening. After a short business session Dr. Schuyler S. Wheeler delivered a lecture on "Electrically Driven Machinery," illustrated by experiments and lantern slides. The evolution of electrical machinery, as influenced by the gradual change from belt driving to electric driving, was traced and the modifications of design showing the greater simplicity thus rendered possible was demonstrated.

Well Pleased and Looks for Every Number.

TO THE EDITOR OF ELECTRICAL REVIEW:

Enclosed please find check of $3 in payment of subscription for 1898.

I am well pleased with the new shape of your journal and look for every number. A. MESSERSMITH.

May 2.

THE ELECTRICAL EXPOSITION.

The Second Week of the Show Closes Gratifyingly.

DR. CHAUNCEY M. DEPEW AN INTERESTED VISITOR—THE STATIONARY ENGINEERS HOLD SEVERAL MEETINGS—A SESSION OF THE NEW YORK ELECTRICAL SOCIETY ENTERTAINED BY A LECTURE BY DR. S. S. WHEELER—THE ATTENDANCE LARGE AND INCREASING.

The second week of the Electrical Show in Madison Square Garden, New York city, closed in an eminently satisfactory manner. The attendance during the week showed a large and gratifying increase over that of the first week. The decorative effects were materially improved, and a number of exhibits delayed in transit were installed and put in operation.

As a man of experience in exhibition matters expressed it, "the week was one of condensation." The rough corners and crudities, which are an inherent element of such exhibitions, were polished off during the week, and the main floor of the Exposition now presents a settled and brilliantly magnificent appearance.

One of the most encouraging features of the show is that the exhibitors have expressed great satisfaction with the enterprise from every standpoint. A striking sign of the times is that the general public which visits the show has taken an unusually keen interest in exhibits of all sorts, especially the operative displays. It is a satisfaction to state that the exhibitors have provided competent assistants to explain their products on view, and that the people in general are anxious to hear these explanations. The result of this can not but be beneficial to the electrical industry as a whole.

The blowing up of the miniature battle-ship continues to attract large crowds each evening. The music, too, has been of a high order. On Friday evening last the Banda Rossa marched into the hall and performed a series of popular selections, principally so that gramophone records could be made in the Garden.

EXHIBIT OF F. A. LA ROCHE & COMPANY AT THE ELECTRICAL SHOW, NEW YORK CITY.

Another exhibit added during the

(Continued on page 322.)

Electrical Review

[OLDEST ELECTRICAL WEEKLY IN THE UNITED STATES.]
TIMES BUILDING, 41 PARK ROW,
P. O. BOX 2339. NEW YORK.

NEW YORK, MAY 18, 1898.

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STEPHEN L. COLES, - - ASSOCIATE EDITOR.
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CHANGES for advertisements must be in this office by Friday noon for the following week's issue. NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

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The demands of the great American public for news of the war has put the newspapers on their mettle, and every scrap of information is promptly sent over the wires, to the great satisfaction and profit of the various cable and telegraph companies.

The months of May and June will be very lively electrical months. About a half-dozen conventions and three big expositions run their course or open in this period.

Edison's presence at the telegraphic tournament given by the Electrical Exposition Saturday evening was an inspiration to all the artists of the key. Each contestant was introduced to Mr. Edison after performing his task, and each received a kind word of congratulation that will always be remembered. As Edison sat listening to the noise of the telegraph instruments, Manager Catlin asked him how he liked the music. "I could stay here all night!" the great inventor and old-time telegrapher replied. "It beats grand opera."

The ELECTRICAL REVIEW calls attention to an article in this issue entitled "Electrical Progress in Japan." The wonderful commercial and technical development of the Japanese empire is interestingly sketched, and a hydraulic engineering project of great magnitude and importance is fully explained. The topography of Japan is favorable to the establishment of hydraulic electric generating plants, and we predict that great progress will be made by the Japanese in this direction during the next few years.

ANIMATED PICTURE RECORDING.

In another column we publish an interview relating to picture-reporting by means of the Edison projectoscope. If, as seems probable under favorable conditions, it is possible to take battle scenes so they can be presented in animated pictures with all movements as they occurred, a wonderfully fascinating field of instruction and entertainment is opened up. The suggestion of Mr. Edison that these pictures might be taken from the bridge of a battle-ship is one that, if put into practical effect, as we believe it can be, would make an indisputable record of every detail portrayed. Particularly will this be true when the use of smokeless powder becomes general, and there is no obscuring smoke from the guns.

THE ELECTRIC LIGHT CONVENTION.

There will be just about time enough after the electrical show in New York closes for the electrical fraternity to get ready to go to Chicago to attend the twenty-first convention of the National Electric Light Association, which will be held at the Auditorium Hotel on June 7, 8 and 9. The ELECTRICAL REVIEW is assured by those in authority that this convention promises to be the best ever held in the history of the association. An excellent list of papers, topics for discussion and lectures have been prepared, and the names of some of the most prominent men in the electric lighting field appear on the programme. The early part of June is about the pleasantest season of the year in Chicago, and it is understood that the entertainment committee has provided suitable recreation for the attending delegates and their friends. The railroad arrangements, as usual, have been handled in a satisfactory manner, and are of the most complete character. A portion of the proposed programme appears in this issue of the ELECTRICAL REVIEW, and the complete programme will appear as soon as it is finished.

The ELECTRICAL REVIEW takes pleasure in presenting in the current issue several handsome engravings showing different sections of the Electrical Exhibition at Madison Square Garden, New York city. These engravings show representative exhibits, and a good idea of the excellence of the whole show may be obtained from them. An interesting feature of this second electrical show is the difference in the kind of questions asked by the visitors of those in charge of the exhibits. At the Exposition two years ago the attendants, who were, as a rule, well informed electrical men, were harassed by having to answer politely the most senseless queries. It has been observed that at this present show the questions asked are of a much more intelligent character, showing that the public in the meantime has learned considerable about electrical matters. The educational influences of exhibitions of this sort can not be overrated.

WALL STREET AND THE ELECTRICAL STOCK MARKET.

The stock market during the past week has been characterized by a revival of speculative interest on the part of the public. The feeling gained strength that the end of the war is not far off and it was contended that if commercial, agricultural and industrial conditions were taken into consideration higher prices must follow on almost all classes of securities. A partial check toward the end of the week was due to the uncertainty as to the outcome of an encounter between Admiral Sampson's fleet and the Spanish war ships.

The resumption of activity was especially noteworthy in the electrical stocks, which for so long had been neglected by the public at large. The leader was General Electric, which sold up from 34½ to 37⅜ on larger transactions than have been recorded in many months. The debenture 5's sold at 102½ to 103. Quite a bullish sentiment developed on this stock, not only due to the company's improved financial position, but also to the action taken at the annual meeting this week. The old board of directors was re-elected, and a resolution adopted by the stockholders "that the interest of the stockholders requires that any proper or necessary adjustment of the impairment of the capital of the company should be promptly made, with a view to the early resumption of dividends." It is learned on authority that no plan has been settled on as yet. Wall Street has figured out that the book value of the stock to-day is 40, allowing only one-half the patents and franchises valuation to stand, and taking the preferred stock at par. Other figuring, taking last year's returns as a standard and allowing $600,000 for writing off depreciation, patents, etc., shows that the company would earn, free and clear, more than $900,000 on the common stock, which is equivalent to 10 per cent on a valuation of 30 for the stock. At the same time it is pointed out that with better times an improvement in business is to be expected, and serves to accentuate that the present quotation for the stock is too low by comparison with a fair book value.

There was likewise increased activity in Western Union, and the stock sold at 89½ to 90⅞. The collateral trust 5's changed hands at 170 and 170½. The strength of the stock was in part due to a speculative interest which has operated in it at

various times this year and is figuring on a still further appreciation. The company's receipts in the past two weeks show good increases over last year, due principally to the government and newspaper business resulting from the war.

North American followed the course of the general market and was more active, advancing from 5½ to 6½. Milwaukee advices show that Milwaukee Electric is highly prosperous just now, a great increase in business having resulted from the location of the volunteers' camp outside the city on grounds reached by the trolley cars. A suburban line reaching various Summer resorts will be opened on June 1. The new city government, contrary to expectations, has as yet developed no active antagonism against the company.

Edison Electric Illuminating of New York opened at 121 and touched 126. The 1st 5's sold at 109 @ 109½ and the consolidated 5's at 115.

A special meeting of the stockholders of the Edison Electric Company of Brooklyn has been called for June 2 to take action upon a proposition to increase the capital stock of the company from $4,000,000 to $5,000,000. An issue of consolidated bonds is proposed wherewith to purchase the control in the Municipal Electric Light Company, of Brooklyn. It is not expected that over $500,000 of the new stock issued will be authorized at present. The money derived from it is to be used for new construction.

American Telegraph and Cable was steady at 91 to 92. A sale of American District Telegraph—100 shares—was made at 22, ex dividend of 1 per cent. The last previous sale was made at the same price January 19.

The Electric Storage Battery Company has closed a contract amounting to $150,000 with the government for batteries to be used in torpedo boats. Recent contracts with the government amounted to $250,000, making a total of $400,000.

On the Boston Exchange American Bell Telephone, on light dealings, ranged between 260 @ 262; Erie, 66½ @ 69; New England was 124 bid, 128 asked; Westinghouse common sold between 21¾ @ 23, and the preferred at 52 @ 53.

In Philadelphia, Pennsylvania Heat, Light and Power was the most active electrical security, selling between 13⅜ and 14. Electric Storage Battery common gained 3 points to 23, while the preferred advanced 1 point to 26. RAY.

Wall Street, May 14.

A NEW AND SCIENTIFIC REPORTER OF BATTLES.

ANIMATED PICTURES OF WAR SCENES TAKEN BY A STAFF OF EXPERTS AT THE FRONT—HOW THE INTERESTING WORK IS DONE.

"We are indulging in a new phase of reporting," said Mr. F. Z. Maguire, Edison's agent, to the ELECTRICAL REVIEW man at the Electrical Show.

"Newspapers are busily engaged and spending money without stint to get news from the front, and we are quite as busy getting picture reports from the scene of action in connection with the war. By picture reports I mean actual animated pictures of the movements of troops, ships, etc. Our representative will be among the first to land in Cuba. He will be properly accredited, and you may expect the portrayal of some very thrilling scenes by means of the Edison projectoscope.

"When a batch of negatives arrives it means practically the issuance of a war extra by us. The subjects are telegraphed ahead to us here, and the factory works day and night to get the negatives properly developed and rushed to the theaters and other customers. We issue extras properly describing the subjects and keep the printers right at it so as not to lose a moment. Telegrams by the score are rushed to the theaters, and in a marvelously short time the pictures are shown to the audience. The anxiety which awaits the first development of a film at the works is very great, as any one of a dozen accidents might happen, which would ruin the production, and time, labor and money would be thrown away. In the film taken at Havana—the 'Funeral of Nine of the "Maine" Victims,' which, by the way, is one of the most remarkable ever taken—there are no less than 2,500 pictures, each one complete and perfect in itself. The scene must have no breaks in continuity or the result is not satisfactory. These scenes are taken at a rate of about 40 pictures per second.

"We have our troubles, however, because we are limited as to the time of day in which to take the pictures. We must have a good light and if battles are to take place at night or in a rain-storm we have to throw up our hands. It seems a large proposition to take a battle, but it can be done, and right in this line let me say that Mr. Edison stated the other day that there should be an animated picture camera on the bridge of every war vessel to take engagements between ships, maneuvers, etc., and thus secure a perfect record of the whole thing. The United States Government has spent hundreds of thousands of dollars in the preparation of the annals of the Civil War. Well, here is a chance for a faithful and more vivid record than is possible in cold type.

"Suppose, for instance, our man who was at Hong Kong shortly before the battle of Manila, and from whom we have not heard for some time (and naturally suppose he went to Manila with one of the ships) had really taken the great naval battle. Would it be possible to find a scene to reproduce which would so thrill an American's heart?

"We are in the infancy of this great invention of Mr. Edison. It surely will be a most important factor in matters of record in the future and play a part in mechanical and medical science as well."

SCIENCE ABSTRACTS.

Persistence of Period in the Faraday Effect. A. Broca. (Journ. de Physique, 6. pp. 678-681, 1897.)—Experiments made (1) with Thoulet's liquid and a Rowland grating; (2) with transparent iron electrolytically deposited on platinized glass, show no alteration of period. If any part of the rotation is due to change of period, it must be less than 1/4000 of the total effect.

Application of the Coherer, A. C. Brown—The author gives a prospective view of the probable applications of the coherer principle. The practical uses may be summarized as: 1. Wireless telegraphy over moderate distances; ship signaling, military telegraphy, fire-alarms and police calls. 2. The cases where a broken circuit or any short distance requires to be bridged without direct connection; e. g., where a wire runs for the greater part of the distance, these cases include railway signaling, communication to lightships and working through faulty submarine cables. 3. Relay circuits for land lines and for submarine telegraphs. 4. Telegraphing over great lengths of bare submerged wires, uninsulated submarine cables or sheathing wires. The limitations of the use of the coherer are carefully discussed; signaling over great distances is considered impracticable; so also is "syntony," except for laboratory purposes. Reports as to the possibility of signaling into iron boxes are discounted. A system of selective receivers is described, whereby each receiver in any municipality may be arranged to respond to a particular set of rated signals, depending upon mechanical harmonic vibration. The most promising application seems to be the use of the coherer in connection with bare submarine cables; the author indicates that several thousands of miles might thus be traversed.

PERSONAL.

Mr. W. H. Preece has been elected president of the British Institution of Civil Engineers.

Mr. A. O. Garrison, of the Columbia Incandescent Lamp Company, St. Louis, Mo., was also present.

Mr. W. S. Turner, consulting and constructing electrical engineer, has opened offices in the new Washington Life Building, No. 141 Broadway.

Mr. Morris W. Mead, superintendent of the Bureau of Electricity of Pittsburgh, and Mr. J. G. Splane, of the National Transit Company, of that city, were New York visitors last week.

Mr. Geo. A. McKinlock, of Chicago; Mr. Charles Selden, of Baltimore, and Mr. F. C. Phillips, of Cleveland, were a trio of prominent electrical visitors at the Electrical Exposition last week.

Messrs. Hart and Pease, of the Hart & Hegeman Company, of Hartford, were New York visitors last week, and took in the Electrical Exposition. Secretary Fish, of the Shelby, Ohio, Incandescent Lamp Co., was a visitor also to the Exposition.

The New York office of the *Western Electrician* in future will be in charge of Mr. R. J. Parvin, at 809 Postal Telegraph Building. Mr. Parvin's predecessor leaves the electrical field to become the publisher of the *National Provisioner*, an influential trade journal, with promise of a greater future.

Mr. V. R. Browning, superintendent of the Globe Carbon Company, of Ravenna, Ohio, is spending some days in the East, taking advantage of the opportunity to look through the Electrical Exposition at Madison Square Garden. Mr. Browning says the factories of the Globe Carbon Company are meeting with excellent success in the introduction of electric light carbons and battery and telephone carbons.

Vice-President W. N. Matthews, of the St. Louis Electrical Supply Company, and manager R. V. Scudder, of the Western Electric Supply Company, also of St Louis, spent a few days last week in Chicago and were taken good care of by Mr. Chas. E. Brown, of the Central Electric Company. The ever genial W. W. Lowe, of the Electric Appliance Company, was also in evidence and the meeting of these western supply magnates will probably result in a closer union among the several firms to mutual advantage, especially in the matter of credits.

THE ENGINEERING RESEARCH LABORATORY IN ITS RELATION TO THE PUBLIC.*

BY PROF. W. F. M. GOSS, OF PURDUE UNIVERSITY, LAFAYETTE, IND.

In the present era of the world's progress we hear much of our "material prosperity" and of the "development of our resources." Feeling sure that the earth was made for man, man is anxious to make his possession yield him its best. Nor is he contented with what his own immediate neighborhood can furnish. If there is anything in the ends of the earth, or in the air, or in the sea, which is capable of making for his advancement, he rests not until he has secured it. The business of the world, therefore, increases with every hour, and its problems multiply.

In the midst of its hum and hurry, the engineer is a prominent figure. It is his province to study the properties of matter, and to make them useful to man in structures and machines. He deals with the mining and reduction of ores, the chemical and physical properties of metals, and all the great variety of processes by which iron and steel are shaped for purposes of construction; with earthwork dams, with systems of municipal piping, with steam engines and pumping machinery, with locomotives and other railway equipment, with bridges and buildings, with ships and harbor improvements—in fact, with structures and machines of every conceivable type.

The engineer is a servant of the people. His ingenuity and skill are the starting point which leads to the employment of all the artisans who fill our shops and factories; his work makes possible the peace and comfort of household life, the success of social affairs and the perfection of business methods, and it often serves to furnish inspiration for modern thought and to give direction to its tendencies.

The basis of the whole science of engineering, extensive as it is, is to be found in facts which have either been deduced from practical experience or derived from especially conducted experiments. The early engineer could neither lean upon accepted theories nor look to precedent for guidance. It was not what Brindley and Telford and Watt and the two Stephensons knew, but what they did, that helped to inaugurate our present era of engineering. Since their day, every important structure has served a double purpose: first, that for which it was especially designed, and, secondly, that which regards it as a subject for observation and study. Where such structures have been a complete success, information concerning them has become a matter of record, and the essential facts have been given a place in the annals of good engineering practice; and where structures have failed, the causes have been carefully studied, that the fault might be understood and consequently avoided in future work. Success, therefore, have inspired imitators, and failures have warned all followers.

But while it is in this manner that a large part of our present fund of engineering data has been brought into existence, and while the process still goes on, it is admitted to have its limitations. The attempt to make the same structure serve as a house and as a means for determining the behavior of certain details entering into its construction, is illogical and expensive. For example, it is poor economy to ascertain the strength of an iron column by finally seeing it fail under the load of a wall. A crack in an arch or a fragment from an exploded boiler may testify to faults in construction, and may even serve as a basis for theories leading to better practice, but the information obtained is dearly paid for in the damage suffered by the collapse of the arch or the explosion of the boiler.

Again, great as are the losses occasioned by failures, they do not equal those which occur through fear of failure. The fear that workmanship may be bad or materials defective, leads to lavishness which could not be justified if our information were more definite. It is indeed true that "factors of safety are factors of ignorance." When it is doubtful just how great a resistance can be withstood by a given bulk of material, we make success certain by building many times stronger than is really necessary. If we could know at the outset the exact value of the stresses involved and the actual strength of the materials to be employed, it would become obvious that such a practice as this could give no additional security, and its results would be wastefulness.

In the domain of machine construction the same general principle applies. The demand is everywhere made for machines that will act with a higher degree of efficiency; that is, do their work with less wear and tear and at a lower running expense. There is no lasting market for inferior goods, and success in competition is to be obtained as the result of merit. Thus it is that designing engineers who give their thought and skill to planning great bridges, buildings and machines are successful in proportion to their ability to simplify and cheapen and at the same time perfect, while all unite upon the general principle that a bridge must not only stand, but it must also involve a minimum of material, and a machine must not only run, but must do its work with the highest degree of efficiency.

It is clear, therefore, that what is needed in engineering work is a more perfect knowledge of the materials and forces involved. This is not a reflection upon the knowledge of the past, but a suggestion that its fund is insufficient for the future. The engineering of the last quarter century has done much to make definite matters which were before but little understood. Facts have been gathered and compared, and from them theories have been deduced. Failures are fewer and the efficiency of structural work, and of machines of every sort, has been increased. But the end is not yet. To-day more than ever before, the attention of the whole engineering world is directed to methods of improving and saving. Its efforts are put forth in response to the demands of a more exacting clientage, and this clientage is the public. It is evident that everything which contributes to the perfection of engineering methods must benefit the people and must arouse their interest, for it is the people who finally reap the advantages, as well as pay the price. Hence public interest in the work of the engineer is keen and critical, and will always sustain any serious movement which promises to advance true practice. Such a movement presents itself in the establishment of laboratories devoted to engineering research.

When all forms of mechanical construction were crude, it was possible to improve by the mere application of experience, but as construction became more refined, it was necessary to examine with greater accuracy and to proceed with greater care. The crude stage in engineering is now a thing of the past, and every day increases the degree of refinement which characterizes the work. The research laboratory stands as a response to these conditions. It is its function to investigate, in a scientific manner, problems which arise in practice or which may be suggested by practical experience. The field of science and the field of engineering combined make up its proper domain. Its equipment, therefore, embraces the delicate apparatus of the scientist and the ponderous machinery of the engineer, and its lines of investigation may be chemical, metallurgical, structural, pneumatic, hydraulic or thermodynamic. Its methods eliminate the complicating conditions of service and allow effects to be traced singly to their causes. For example, efforts to determine the power and efficiency of locomotives while in service upon the road extend back through more than three decades, with no general result that is satisfactory. But the difficulties and inaccuracies which appear in the process of road-testing entirely disappear when tests are made in the laboratory, for here it is possible to maintain for an indefinite period an unvarying condition of speed and load, and to employ sensitive apparatus in observing the performance of the machine.

There have been many instances where locomotives on the road have left bent rails in the track behind them, but it required the laboratory to demonstrate that, under conditions not uncommon in practice, the drive-wheels of a locomotive leave the track at every revolution. This having been proved, the matter of the bent rails was easily explained.

Again, it has been assumed for years that the draft produced by the exhaust steam in a locomotive was the result of an action similar to that of a pump; that each puff from the cylinders supplied a ball of steam which filled the stack as a pump-piston fills its barrel, and pushed before it a certain volume of the smoke-box gases until it passed out at the top of the stack. Believing this view to be the true one, designers have shaped the details of locomotive draft appliances accordingly, and the value of proposed improvements has been measured by the completeness with which they have satisfied the conditions of the accepted theory. But the processes of the laboratory have disproved this whole assumption. They have shown that the steam does not fill the stack except at its very top, and that the action of the jet is clearly one of induction. In accordance with these results a new theory has been formulated, and although it is but a few months old, the laboratory facts which sustain it are so conclusive that it has already been

*From Proceedings of the Indiana Academy of Science.

generally accepted. These illustrations, drawn from a single field of investigation, will serve to show something of the character of the work done by the research laboratory. They might, with equal justice, have been selected from any one of the many different departments into which engineering research may be divided. But they have served their purpose if they have emphasized the fact that the laboratory process gives results which can not be obtained in any other way, and that these results may be relied upon to guide and direct practice in engineering affairs.

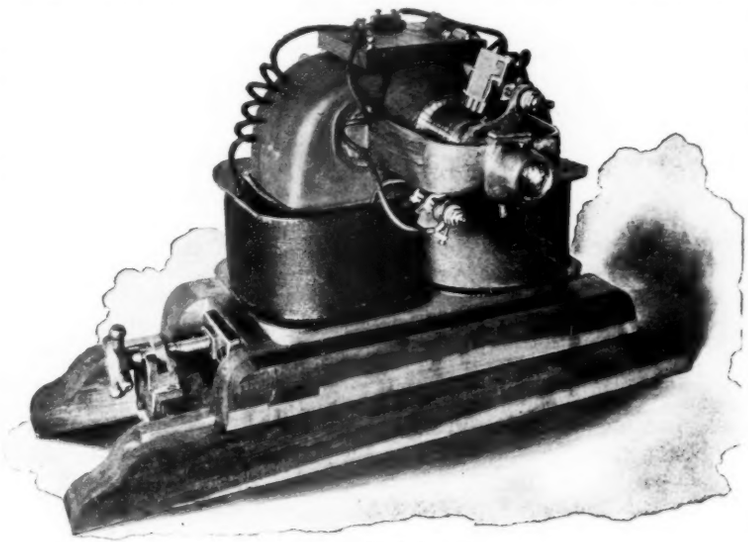
English technical papers admit that the painstaking processes of German laboratories have so well guided German manufacturers that Germany not only competes with England in many lines of manufactured goods, but in some has driven her from her markets. We have a new country, in which large engineering enterprises, both public and private, are always being pushed and are calling for economy in expenditures; and there is a strong national desire for an outlet for manufactured goods through exportation, which can only be secured on merit, in competition with the world. With these facts in mind, the conclusion is obvious that there is room and need in this country for research laboratories. All such laboratories are but means to an end. They are not only contributors to the public fund of information, but they infuse into every branch of construction and of operation a spirit of accuracy and a desire for excellence.

Wireless Telegraphy Between Balloons.

Some of the most recent experiments in wireless telegraphy have been made by Professor Slaby, who has been able to send intelligible Morse signals 13¼ miles, using two balloons filled with hydrogen to elevate the end conductors 1,000 feet in the air, says an exchange. In this way he was able to transmit signals 70 times the length of his electric base line. Prof. S. P. Thompson, who spoke of these experiments before a British society, stated that in his opinion it was possible to devolop the conduction or the induction methods of wireless telegraphy so as to communicate between England and India at far less cost than would be necessary with the employment of submarine cables. He was doubtful whether the wave method would be found practicable in such a case, as the curvature of the earth would interfere with the propagation of the electric waves.

The "Rochester" Dynamos and Motors.

A series of direct-current dynamos and motors in sizes from one-quarter to 25 horse-power has recently been perfected, constructed with the same general features as shown in the illustration herewith. The characteristics of construction are sectional-wound armatures, interchangeable field magnet coils, self-oiling bearings, magnets cast in one piece, and extra heavy insulation. The cut herewith shows a three-horse-power motor for belted service, and illustrates a type of machine from one-quarter to five horse-power. Above five horse-power uprights in place of yokes for bearing supports are used with iron bases and foundation rails. These machines are manufactured by the Rochester Electric Motor Company, Rochester, N. Y., a company which has been in existence for several years, but during the last few weeks has undergone a reorganization with an infusion of new and younger blood. The officers of the company are F. C. Kimmel, president; Edw. S. Davison, secretary and treasurer, and P. J. McDonald, superintendent.



THE "ROCHESTER" DYNAMO.

The Central New York Telephone and Telegraph Company are just now in the midst of reconstruction, which will change the system from overhead to underground. This will embrace every late idea, including a large building erected by the company in Syracuse for its exclusive use where the subway and terminal arrangements will accommodate 6,000 metallic circuits. The central office arrangements will differ in some features from anything before installed.

Roentgen on the Roentgen Rays.

Such a host of investigators have devoted themselves to the development of Profssor Roentgen's great discovery, that it would be no matter for surprise if there was nothing left for the discoverer to find out about his own discovery, says our London namesake. Some novel properties of the X rays, however, have been described by Professor Roentgen in a third communication on this subject to the Berlin Academy. Among these the following appear to be especially interesting. If a fluorescent screen is covered with a plate completely opaque to the X rays, a slight fluorescence can nevertheless be seen when the tube is in action. Roentgen has shown that this is due to rays proceeding from the air of the room, which emits X rays wherever it is itself exposed to their action. This fact points to the necessity of placing photographic plates in a sheath of lead when used for long exposures, to prevent them being fogged by diffused rays from the back or sides. Of the rays which are given off by the platinum plate of a focus tube, those are most effective for producing pictures which leave the platinum at as great an angle as possible, within a limit of 80 degrees. The specific transparency of bodies is greater the thicker the body. The ratio of the thicknesses of two equally transparent plates of different material is dependent on the thickness and the material of the medium through which the rays have to pass before they reach the plates. For instance, the ratio of the thickness of platinum and aluminum plates of equal transparency will be reduced to one-half if the rays are passed through a thick glass plate before they strike the metal plates. Roentgen, like Swinton and others, has shown that the contrast between bodies of different transparencies depends on the electro-motive force used to excite the tubes. A spark gap in the secondary circuit acts in the same way as an intercalated Tesla transformer; both produce more intense and less easily absorbed rays. By the use of a Tesla transformer and wire electrodes in a narrow tube, X rays can be produced with a vacuum of 3.1 millimetre, the usual vacuum being, of course, about 0.0002 millimetre. Hard tubes, as Roentgen calls those tubes which require a very high electro-motive force, can be softened, as is well known, by heating, or by readmission of air, or, as is not so well known, by heating limetree charcoal placed in a side tube, or by sending through the tube a very powerful discharge. The composition of the rays given off by the platinum anti-cathode depends essentially on the time change of the discharge current. The quality of the rays is not affected by the change of the primary current, but their intensity is proportional to the strength of th primary current.

Curative Properties of Roentgen Rays.

The Vienna correspondent of the London *Times* telegraphs that some interesting particulars of a new application of the Roentgen rays for curative purposes were communicated by Dr. Edward Schiff, lecturer at the Vienna University, at the last sitting of the Imperial and Royal Medical Society. A series of experiments conducted by Dr. Schiff and his assistant proved that these rays could be used for the cure of disease in a manner capable of perfect control by means of a more or less intense application for a longer or shorter period, producing reaction in the exact degree required. In this way it has been possible for the lecturer, on the one hand, to remove hair from parts of the body where it constituted a disfigurement without causing the slightest inflammation, while, on the other hand, he has been able to treat lupus with uniform success by means of an artificial inflammation, the intensity of which he was in a position to increase or reduce at will. The results secured by the new method, both in the removal of superfluous hair and the treatment of lupus, were demonstrated in the persons of some of Dr. Schiff's patients.

The Improved Warren Inductor Alternator.

The central station plants of the country include in nearly all their new work induction machines. This is evidence that the station managers are realizing the importance and value of this type of generator. Modern engineering practice shows a noticeable preference for an inductor type of machine for important installations. Particularly is this true of power transmission where high voltage is necessary and continuous operation essential. Induction alternators are particularly well adapted to this class of work, as the revolving part carries no brushes, commutators, or wire, a proper lubrication of the bearings being about the only attention required.

The latest machine of this type, known as the Warren inductor alternator, is built by the Warren-Medbery Company, of Sandy Hill, N. Y. Mr. H. J. Medbery, well known in electrical circles, is the president and general manager; Mr. H. B. Warren, vice president and electrical engineer; Mr. H. E. Tidmarsh, secretary, and Mr. George W. Wait, treasurer. The principal owners of the company are prominent residents of Sandy Hill, N. Y.

The following details of the apparatus of this company will interest the users of machines of this class:

The lower half of the frame of the machine, with the base and supports for bearings, constitutes a single casting, insuring great strength and rigidity in the machine, guaranteeing the accurate centering of the revolving inductor while assembling the machine and maintaining perfect alignment while in operation. The bearing sleeves are lined with a high grade of anti-friction metal, the bearing surfaces are unusually large, and the peripheral speed of the shaft in the bearings is moderate. The bearings are self-oiling from an oil reservoir of large capacity, and the distribution of oil throughout the bearings is abundant, being effected by a peculiar arrangement of oil ducts in the interior of the bearing sleeves. The bearing sleeves are made solid, as being the most convenient form for babbitting, in case it should become necessary to reline the bearings. The supports for the bearings are so designed, that when it is desired to remove a bearing sleeve the only operation necessary is the removal of the bearing cap, after which the sleeve may be slipped endwise off the shaft.

By the method of construction all of the coils of the machine are readily accessible for inspection and repairs.

For the armature metal of a very thin gauge is used, and the sheets are served on both sides with an insulating compound, which is not affected by heat or age. By this means the armature eddy currents are thoroughly broken up and practically no loss of power occurs from heating. In addition to this there are a series of recesses between the cast frame and the outer circumference of the armature which admits of the free circulation of air entirely around the armature. These recesses are entirely internal, and the exterior of the frame casting is retained smooth and symmetrical, without unsightly openings for ventilation purposes. The machine operates remarkably cool, as no part rises over 50 degrees Fahrenheit, even when operated continuously under 10 per cent overload.

The insulation of coils is mainly obtained from a special insulation. These coil slots or troughs are semi-flexible, practically non-combustible, will not absorb moisture, are not affected by oil and will not deteriorate with age. The troughs for 1,000 and 2,000-volt armatures are subjected to a break-down test of 6,000 volts, and the troughs for high-voltage armatures are subjected to a minimum of 15,000 volts break-down test. After the troughs and coils are in place in the armature an insulating perforated cover closes up the coil slot and secures the coil and troughs in position. The slot cover is perforated, which allows the revolving inductor to drive a continuous current of air around the coils. This produces such a cooling effect that these machines may be operated continuously under heavy overloads without serious heating of coils.

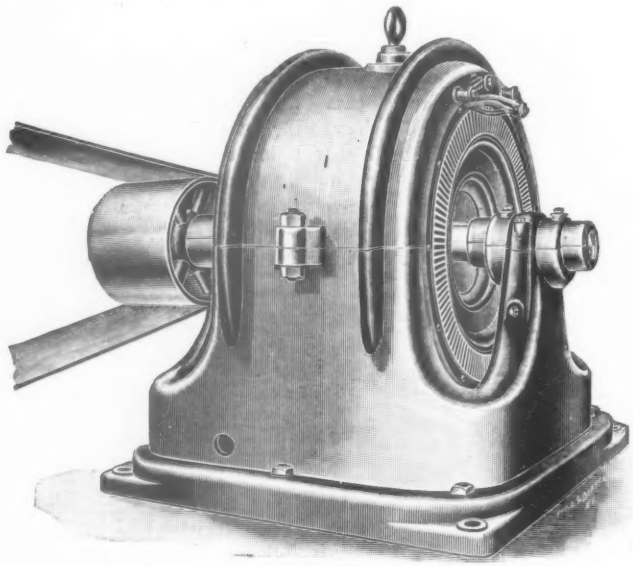
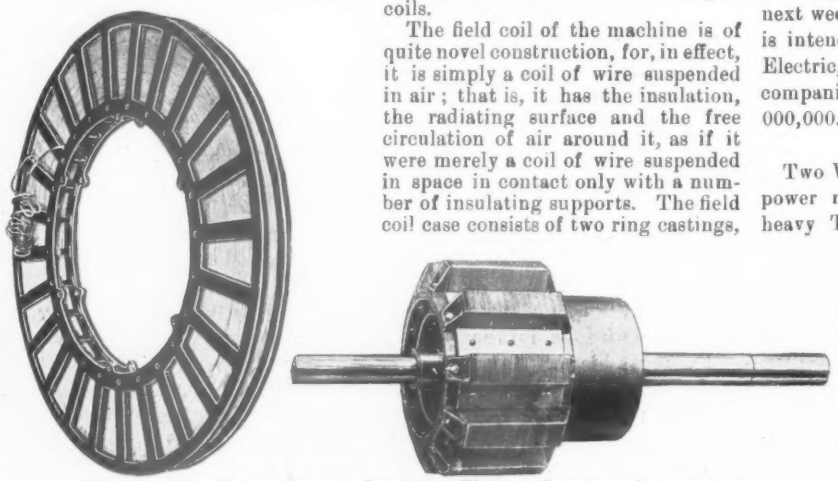


FIG. 1.—THE IMPROVED WARREN INDUCTOR ALTERNATOR.

The field coil of the machine is of quite novel construction, for, in effect, it is simply a coil of wire suspended in air; that is, it has the insulation, the radiating surface and the free circulation of air around it, as if it were merely a coil of wire suspended in space in contact only with a number of insulating supports. The field coil case consists of two ring castings, spaced apart with rods of insulating material, and the sides lined at numerous places with narrow strips of narrow material. The rotation of the inductor produces an agitation of air all around the field coil, with a constant circulation outside through the openings in the yoke, and the coil will stand severe overloads without injury.



FIGS. 2 AND 3.—DETAILS OF THE IMPROVED WARREN INDUCTOR ALTERNATOR.

The machines are of fine finish, and the efficiency is remarkably high, the manufacturers stating that they are equal in this respect to the best designs of direct-current generators and that the inherent regulation is by far the best yet attained in alternators of any type. To the many excellent features the Warren-Medbery company has united a workmanlike construction, simple and durable and producing a practical and reliable machine.

A machine of 150 kilowatts was recently installed in the station of the Ballston Electric Light Company, Ballston Spa, N. Y., by the Warren-Medbery Company and they will now be manufactured on an extensive scale. Illustrations of the machine and its details are shown on this page.

Pennsylvania Street Railway Association.

Mr. S. P. Light, Lebanon, Pa., secretary of the Pennsylvania Street Railway Association, writes to the ELECTRICAL REVIEW stating that the date of the meeting of that association will be October 19 and 20. The regular date of this meeting would bring it on the same date as that of the American Street Railway Association in September, therefore the change has been made to October.

Is There to be Another Electrical Consolidation?

[*Pittsburgh Press, May 10.*]

A movement is being made to consolidate the electric business of the country under one management. A meeting is arranged to take place next week in New York, by which it is intended to combine the General Electric, Westinghouse and Walker companies, with a capital of $100,000,000.

Two Westinghouse 12-A 25-horse-power motors were placed on the heavy Taunton snow-plows of the Milford, Holliston & Springfield, Mass., Railway early in the Winter. The superintendent of the railway, Mr. G. B. Larrabee, reports that during a very severe Winter, in which the heaviest storms were encountered that have occurred for several years, the motors never caused a stoppage, nor were guilty of a burn out. During the heaviest storm the motors were only normally warm. These motors were of the ordinary standard Westinghouse type, and, considering the severe service, they have made a very good showing.

Stockholders of the Hammond, Whiting & East Chicago Electric Railway have elected the following officers: President, A. Murray Turner; vice-president, D. M. Cummings; treasurer and secretary, O. S. Gaither; directors, A. M. Turner, V. S. Kennedy, O. S. Gaither, D. M. Cummings, G. L. Bradbury.

ELECTRIC RAILWAY NOTES.

The Petersburg, Va., Electric Railway has been placed in the hands of a receiver.

C. W. McElyea has sold the Cedar Falls, Iowa & Normal Street Railway to a local company for $25,000.

The Wilkesbarre, Pa., & Northern Railroad, between Wilkesbarre and Harvey's Lake, will be hereafter operated by electricity.

The Ottumwa, Iowa, Electric Railway, Heat and Power Plant has been sold at public auction. It was purchased by trustees for the bondholders for $190,000. The plant cost $500,000.

Cincinnati, Newport & Covington Street Railway net earnings for the first three months of this current year increased $10,338.93 over the corresponding three months of last year. The gross earnings for April increased $4,000 over April last year.

During the week ending Sunday, May 1, the South Side elevated railroad carried 370,858 passengers, a decrease of 1,623 passengers as compared with the previous week. The average daily traffic for the week was 53,212 passengers, against 52,386 the preceding week.

R. M. Archibald, administrator of Henry Benster, has sued the Street Railway Company, of Cincinnati, Ohio, for $10,000 damages. Deceased was struck by an electric car after getting off a cable car on Broadway, near Ninth street, to get his hat, which had blown off.

Dr. Hal C. Wyman has brought suit against the Chicago, Detroit & Toledo Railroad, alleging that the road, as it is proposed to build it, runs directly in front of his farm and Summer residence in Brownstown township, valued at $10,000, lessening the value of the property.

Franchises have been granted for the extension of the Consolidated Street Railroad from Worcester, through Millbury, North Grafton and Grafton, Mass., a distance of 10 miles. Work will be begun at once, and the roads will be opened in the Fall. The cost of the operation is estimated at $150,000.

The Chicago, Hammond & Western Road Company has certified to a consolidation of organization with the Chicago & Indiana State Line Railway Company under the name of the Chicago Junction Railway Company. The capital stock of the consolidated road is $2,200,000.

The Westinghouse Electric and Manufacturing Company has secured a contract for four 300-horse-power generators, three boosters, 40 50-horse-power motors, 10 car equipments and a complete switchboard for the equipment of the Detroit, Ypsilanti & Ann Arbor Railroad.

The capital stock of the Stillwater & Mechanicsville, N. Y., Street Railway Company has been increased to $250,000. The increase is to be used by the company in the construction of a new line to run from Mechanicsville to Waterford, where it is to connect with the Troy City Railway.

The Joliet, Ill., Street Car Company, purchased by a syndicate in 1896, has again changed hands. This time the Joliet Railroad Company is the owner, having purchased the line for $600,000. President, Weston F. Milliken; vice-president, George F. Duncan; treasurer, George P. Cox; secretary and attorney, Henry Woodman; manager, William McKinley; superintendent, C. C. Rush.

EXHIBIT OF THE CROCKER-WHEELER COMPANY, AT THE ELECTRICAL SHOW, NEW YORK.

Directors of the West Chicago Street Railway Company have declared the regular quarterly dividend, payable May 16, to stockholders of record May 5. The company's gross earnings for the week ending Sunday, May 1, showed an increase of $2,478, as against an increase of $52 for the preceding week, and an increase of $2,110 for the week before that. The following treats of gross earnings:

Week ending May 1, 1898	$74,103 78
Week ending May 2, 1897	71,625 74
Increase for week	$ 2,478 04
Increase for week, per cent.	3 45
Increase since Jan. 1, per cent.	4 48
Daily average, increase per week	345 01
Daily average, increase since Jan. 1	439 86

The Metropolitan Street Railway Company, of Kansas City, Mo., will spend $250,000 in changes and improvements of its lines this year. The work to be done will include the change of the Fifth street line from a cable to an electric line before the end of September; the putting in of a new electric machine at the Riverview power-house; the putting on of 25 new electric cars, and the welding of 6,000 rail joints on the Fifth street, East Ninth street, East Twelfth street, Main street and Eighteenth street lines.

EXHIBITS OF THE PERU ELECTRIC MANUFACTURING COMPANY, AND THE GARVIN MACHINE COMPANY, AT THE ELECTRICAL SHOW, NEW YORK.

EXHIBIT OF THE "PARAGON" FANS AND MOTORS BY J. P. WILLIAMS, AT THE ELECTRICAL SHOW, NEW YORK.

ELECTRIC LIGHT FLASHES.

The contract for lighting the streets with electricity has been awarded to the Wilmington, Del., Street Railway Company.

At the first annual meeting of the Warwick, N. Y., Electric Light and Power Company Mr. Clinton W. Wisner was elected president and Mr. J. H. Sharpe, general manager.

The contract for electric wiring, in connection with the electric lighting of the western staircase, approaches and lobbies of the Capitol Building at Albany, N. Y., has been awarded.

It is said that some important developments in connection with the business of the Edison Electric Illuminating Company of Brooklyn are contemplated. They will enable the company to make larger and more profitable use of its new South Brooklyn plant, which has been built with reference to enlargement of the company's field of operation. The Edison Company has purchased the Municipal Company.

At the meeting of the Farady Heat, Power and Light Company, of Morton, Pa., the following officers were elected for the ensuing year: President, Richard Young; treasurer, William H. Farrand; secretary, Arthur A. Benkert; solicitor, Garrett E. Smedley; directors, Richard Young, Thomas J. Hunt, Edward Sellers, William H. Farrand, J. Frank Beatty, Garrett E. Smedley and Dr. A. R. Morton.

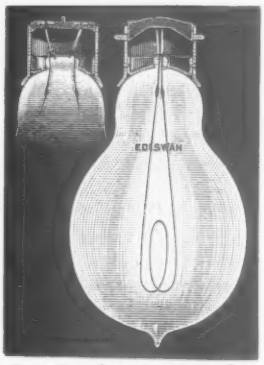
A Dry Cap Incandescent Lamp.

The English electrical papers are describing the dry cap lamp shown in the illustration, which is specially recommended for use in damp places or outside lighting. The lamps are specially suited for mines, pier lighting, or damp cellars, where it has been found that the plaster of Paris softens after the lamps have been in use for a little time. The cap is attached by means of a brass disk and is fastened to the glass bulb by specially prepared cement, which is thoroughly damp-proof, and the leading-in wires are perfectly free, so that the lamp has an air insulation in the interior of the cap. It is important to note that although there is an air insulation, by using the thin layer of cement between the brass and the glass, it acts as a non-conductor, and consequently there is very much less heat conducted than there would be if the brass and glass were not intercepted.

The Michigan Telephone Company is reported to have gained 375 subscribers during April.

LITERARY.

In view of the great interest that is being taken in the movements of the United States Navy at the present moment and the scarcity of reliable information concerning it, Munn & Company, of New York city, have prepared the *Scientific American* "Special Navy Supplement." The issue has been prepared with great care, and every effort has been made to make it as complete and accurate as possible. The work includes a brief history of the navy between the years 1883–1898, with the authorizations up to date. The method of classifying the various types of war vessels is explained, and a full description is given of all the principal war vessels under the following



A Dry Cap Incandescent Lamp.

main-heads: Battleships, cruisers, monitors, gunboats, torpedo boats, etc. Valuable tables of statistics are also given, and a colored map of Cuba.

The current issue of *Collier's Weekly* is believed by its publisher to be the most largely illustrated "war number" ever made in the United States. Of the 16 pictorial pages, 14 are occupied—most of them entirely covered—by photographs or drawings of troops, war vessels, camps, naval prizes, military and naval officers, etc. The frontispiece is a decorative piece of patriotic motive and showing portraits of the three major-generals of the army. The double-page picture shows a camp of regulars at Chickamauga Park, drawn by W. R. Leigh. Two pages are given to the scene of war in the Philippines; a view of Manila extends across the bottoms of two pages, at the tops of which are the vessels of the American and Spanish fleets, drawn from photographs, and the portraits of the contending admirals are given.

Maggie Meyer has secured a verdict for $500 against the Ohio Valley Telephone Company. She sued for $1,000 damages, claiming that employés of the defendant came upon her premises on the Bardstown pike and destroyed a fine shade tree.

THE ELECTRICAL EXPOSITION.

(Continued from page 315.)

week was shown in the space of the New York Telephone Company. It consisted of a complete submarine diver's suit equipped with a telephone, by means of which the diver can be kept in constant communication with his attendant above the surface of the water. This exhibit, which was loaned by the American Bell Telephone Company, attracted a great deal of interest.

The New York Electrical Society held its 187th meeting in the concert hall of the Garden on Thursday evening. Dr. Schuyler S. Wheeler delivered an interesting lecture on "Electrically Driven Machinery." Mr. Chauncey M. Depew, escorted by president C. O. Baker, Jr., of the Exhibition company, attended Dr. Wheeler's lecture and expressed great interest and delight.

Dr. Depew also had his photograph taken by electric light and, as he always does, took occasion to thoroughly enjoy himself. Under the able and agreeable ciceronage of Mr. Baker, Dr. Depew did the exhibition thoroughly and remarked afterwards that he had learned a great many things he didn't know before.

During the week meetings of the National Association of Stationary Engineers were held as follows: May 9, No. 33, of New York; May 10, No. 29, of New York; May 11, Nos. 4, 11, 13, 15 and 16, of Connecticut; May 12, No. 2, of New York; May 13, No. 27, of New York, and No. 1, of Connecticut; May 14, No. 7, of New York.

The most ubiquitous official connected with the Exposition is general manager Marcus Nathan, who, in a quiet and forceful manner, handles his multifarious duties and responsibilities with the intelligent judgment of a veteran. He has succeeded in what appears to the layman an almost impossible task, that of keeping things running with the minimum of friction and the maximum of effect. Mr. Nathan is entitled to the congratulations and thanks of everybody connected with the Electrical Exposition.

ELECTRICAL EXHIBITION NOTES.

Among the interested out-of-town visitors at the show last week was Mr. Edwin F. Baker, general superintendent of the Brush Electric Company, of Baltimore, Md. Mr. Baker holds a commission in Dr. Louis Duncan's volunteer electrical corps in Baltimore, but managed to spare enough time to run up to New York to visit the Electrical Exhibition.

Burnharm-Granger, New York, are showing one of the "Woodbury" automatic cut-off engines attached to the Eddy multipolar generator, using the Shepard governor and an automatic oiling system. This exhibition is interesting as showing great perfection in speed regulation.

The Card Electric Company, Mansfield, Ohio, have been a little delayed in preparing an exhibit which will include several types of their motors and dynamos equipped with automatic safety and limit switches.

The Crown Woven Wire Brush Company, Salem, Mass., have arranged to show their woven wire brushes in connection with the exhibition of H. B. Coho & Company, their New York representative. F. S. Burke, manager of this company, was at the opening of the Exposition.

The Keystone Electrical Instrument Company, Philadelphia, have a handsome switchboard on which are shown a number of the company's standard forms of switchboard instruments. These include potential indicators, arc-light voltmeters, ground detector, ground detector for constant-potential circuits, type "K" illuminated dial and a pair of type "R" instruments. The pair of the type "R" instruments is connected to the dynamo and motor which is in operation. A number of the "Keystone" portable instruments are also on view, including voltmeters for direct and alternating current. Mr. Elmer P. Morris, the New York representative for this company, is in charge of the exhibition.

John A. Roebling's Sons Company, by their unique Doric building of white, have added greatly to the interior appearance of the Exposition. The several rooms in the building are artistically furnished and draped and are decidedly a feature of the Exposition. The wire side of the Roebling interest is not obtrusive, but interesting samples are shown. The following gentlemen representing the Roebling company are frequently in attendance in the evening: Messrs. H. L. Shippy, W. L. Doyle, M. R. Cockey, A. M. Whittaker, W. S. Eckert and E. W. Swan.

The Partridge Carbon Company, Sandusky, Ohio, have a complete line of their carbon products on exhibition, which includes dynamo generator and motor brushes and many other forms of carbon as it is used electrically. An important feature also is the new arc-light carbon which this company have been perfecting for many months and which is said to be equal to the imported carbon. This company is represented by Messrs. Wood, Shaw & Company.

Wood, Shaw & Company, a new electrical firm, 40 Broad street, New York, have an exhibition which in-

cludes the Partridge carbon products; dynamos and motors made by the Quaker City Electric Company, Philadelphia; products made by the O. S. Platt Manufacturing Company, Bridgeport, Ct.; lightning arresters made by the Universal Electric Company, New York, and electric light and telephone poles.

Mr. Elmer P. Morris, New York, has arranged interesting exhibits for the following companies, all of which he represents in New York and the East: Keystone Electrical Instrument Company, Philadelphia, manufacturers of the "Keystone" electrical instruments; Garton-Daniels Electric Company, Keokuk, Iowa, lightning arresters; Warren Electric and Specialty Company, Warren, Ohio, incandescent lamps; Technic Electric Company, Philadelphia, switches and switchboards; Highland Electro-Chemical Company, Connellsville, Pa., soldering compound; Forest City Electric Company, Cleveland, Ohio, rail bonds and drop forge commutators; Simonds Manufacturing Company, Pittsburgh, makers of pinions and gears, and the "Cosmic" oil filter, made at Easton, Pa.

J. H. Wilday, New York, exhibits an electrical engraving machine. The machine can be run either by incandescent circuit or by storage battery.

Benjamin F. Kelly & Son, New York, are showing the operation of one of the Berriman feed water heaters and purifiers, which are made with the improvement under the Kelly patent.

The Onondaga Dynamo Company, Syracuse, N. Y., have a plant in operation, consisting of a 75-kilowatt generator connected to the tandem compound Fisher engine. This company is represented in New York by Messrs. Sumner & Fairchild.

Ward Leonard Electric Company, Bronxville, N. Y., show a complete line of circuit-breakers and rheostats of the Carpenter type; also the new outlet boxes and switch boxes, which they have recently put on the market.

H. B. Coho & Company, New York,

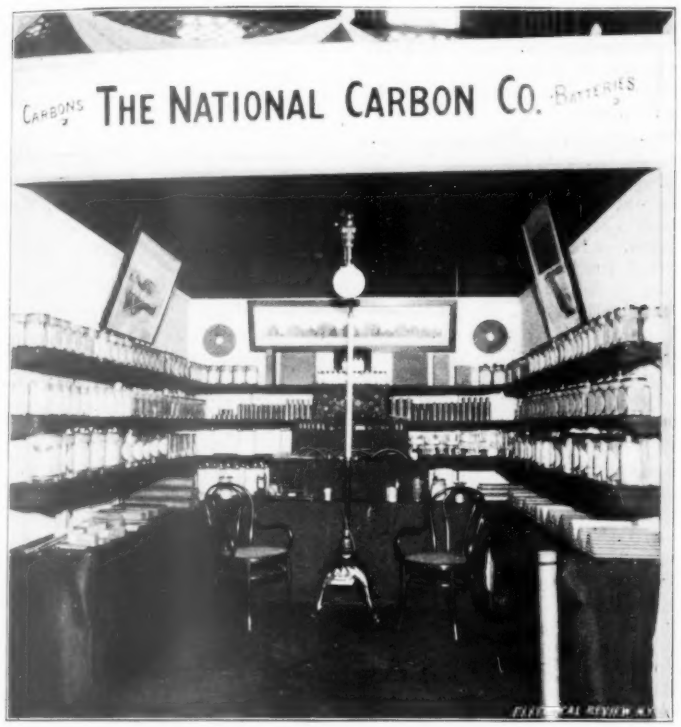


EXHIBIT OF THE NATIONAL CARBON COMPANY AT THE ELECTRICAL SHOW, NEW YORK CITY.

have prepared an elaborate exhibition, showing the electrical machinery and apparatus for which they are selling agents. This includes several splendid specimens of "Eddy" generators and motors, one of the Warren alternators, telephone apparatus made by the Pennsylvania Electric Company, at Marietta, Pa., and the "Crescent" fans made by the Marietta Manufacturing Company, Marietta, Pa.; also a rheostatic equipment manufactured by the American Rheostat Company, Milwaukee, Wis.; motor and dynamo brushes made by the Crown Woven Wire Brush Company, Salem, Mass., and one of the Van Horn-Burger & Company gas engines.

J. P. Williams, New York, sales agent for the "Paragon" fan and power motors, has a complete line of fan motors of all styles on view, also several of the small power motors in operation, one rocking a cradle.

The American Engine Company's installation of a 25-kilowatt, six-pole generation directly connected to an "American-Ball" engine of the latest design attracts much attention because of the smoothness of operation. The plant moves an "American-Ball" motor and assists in furnishing light and power for general use in the Garden.

The Fort Wayne Electric Corporation have a large space on the main floor, in which are shown the standard types of the "Fort Wayne" arc light machines, arc lamps and other electrical apparatus made in the Fort Wayne shops.

The International Arc Lamp Company's exhibit of "MacIntire" arc lamps, a pendant arcolier weighing 1,500 pounds, carrying 40,000 candlepower, is one of the pretty features of the show.

The Hope Electric Appliance Company, Providence, show their make and break switches and other apparatus in co-operation with Mr. H. B. Kirkland, the New York representative.

The Gold Street Car Heating Company, New York, have a very complete showing of all the modern forms of electric heating apparatus, particularly several types of "Gold" heaters as applied to street cars. Messrs. Gold, Banks, Weston and Beach, of this company, are frequently to be seen in the exposition building.

The space occupied by the Fostoria Incandescent Lamp Company, Fostoria, Ohio, is beautifully illuminated every evening with artistic groupings in various colors of the Fostoria incandescent lamps.

The Safety Insulated Wire Company, New York, have prepared an exhibit on the left of the gallery which contains several unique features. The one which attracts the public eye is the miniature model of Sandy Hook and the surrounding waters, showing the system of electric buoys, with tiny lights of red and white, properly arranged just as the channel and waters are buoyed. Floating on the water is a miniature war-ship, and gold-fish swim about, giving it the appearance of real life. The idea of the work is to show that "Safety" cables are used in connection with the government buoys. A section of a huge cable, designed for possible telephone connection between London and New York, is of much interest, showing the manner in which such a cable would be constructed. Also, carrying out the war effect of the small war-ship on the water, a grim, black cannon, with its shells, stands in the corner. The whole plan of the Safety exhibit is unique and artistically planned, and is worthy of general manager Leonard F. Requa, who is said to have designed it. The gentlemen of the Safety Insulated Wire Company who are frequently seen in attendance at the exposition are Mr. Leonard F. Requa, general manager, and Messrs. Richards and Eckert.

A model of the magnetic iron ore extraction system, which was reconstructed by Mr. James P. Williams, the well known inventor of the "Paragon" motors, is of general scientific interest, and nightly attracts many people.

Machado & Roller, electrical engineers of New York, are showing a full

VIEW FROM SOUTH GALLERY, CENTER OF ELECTRICAL SHOW—ARCOLIER, EXPLOSION TANK AND SEVERAL MAIN FLOOR EXHIBITS SHOWN.

(Continued on page 325.)

ADVANCE INFORMATION

Electric Light and Power.

ATHENA, NEB.—An electric light plant is to be established here.

KAUFMAN, TEX.—The new electric light plant at this place is nearly completed, and the finishing touches will be put on in the next few weeks. This same company intend putting in a complete system of waterworks as soon as the light plant is completed.

SUMTER, S. C.—The Sumter Ice Manufacturing Company contemplates the erection of an electric light plant.

GREENVILLE, TEX.—D. M. Robinson and D. J. Byrd have franchise for an electric fan system.

HARPER'S FERRY, W. VA.—J. C. Hanger and others, of Charlestown, W. Va., will erect an electric light plant at this place.

WESTVILLE, PA.—A movement is on foot in this place looking to the establishment of an electric light plant.

HIGH FALLS, N. Y.—The firm of McCaghey & Linehan, of Sandy Hill, N.Y., who have constructed the plant and dam of the Dolgeville Electric Light and Power Company at this place, have been awarded a contract to build an electric power station at Plantsville, Ct., for the Meriden, Southington & Compounce Tramway Company.

PIEDMONT, W. VA.—An electric light plant will be constructed. Contract for same has been awarded to the D'Olier Electric Company, 129 South Eleventh street, Philadelphia, Pa.

ROCKPORT, ME.—A five-year contract is to be made by this place with the Camden & Rockland Electric Company.

GREENVILLE, MISS.—J. M. Lee, City Clerk, may give information concerning lighting of streets by electricity.

MIAMA, FLA.—Fred C. Thomas, C. S. Van Houton and H. E. Robinson have been granted a franchise for a plant in this city.

TORRINGTON, CT.—The E. A. Perkins Electric Company has been incorporated by E. A. Perkins and others; capital stock, $5,000.

ALEXANDRIA, VA.—The Victor Electric Company has been granted a charter by Judge Norton; capital stock, $25,000.

MARTINSBURG, W. VA.—The Martinsburg Electric Company will expend for new dynamos and engines $1,200.

MIDDLEPORT, OHIO—An electric light plant is to be established here.

SULPHUR, KY.—James A. Gividen has announced his intention to put in an electric light plant here.

GREENSBORO, N.C.—W. H. Houghton will establish an electric light plant.

LEXINGTON, TENN.—H. E. Graper is interested in proposed establishment of electric light plant.

YARDLEY, N. J.—The Provident Electric Light and Power Company has been reorganized, and will hereafter be known as the People's Electric Light and Power Plant.

ONEONTA, N. Y.—The Electric Water-Power Company has been incorporated, with a capital stock of $30,000.

New Telephone and Telegraph Companies.

FORT COLLINS, COLO.—The telephone system of this county is about to be extended from this city to Livermore, 25 miles northwest of here. The line will connect with La Porte and Bellevue, two intermediate points. The line will be constructed conjointly by the citizens of Livermore and the Colorado Telephone Company.

LEXINGTON, VA.—The Commercial Telephone line between this place and Staunton has been completed.

WEST CHESTER, PA.—The Chester County Telegraph and Telephone Company is arranging to extend its line from this place to Oxford, via Kennett Square, Avondale and West Grove.

ST. LOUIS, MO.—A telephone line from this place to Kansas City will soon be in use, which will also be available for Topeka.

KANKAKEE, ILL.—The Eastern Illinois Telephone Company has certified to an increase of capital stock from $15,000 to $25,000.

ALBION, ORE.—A move is on foot to build a telephone line connecting this place with Oakley, Minidoka and Kelton, and ultimately with Ogden.

RUSH CITY, MINN.—The Northwestern Telephone Company has been incorporated with a capital stock of $50,000.

QUEBECK—Work on the telephone line from Sparta to McMinnville, which is to be built by the Gainesboro Telephone Company, will be begun in a few days. It will connect with Quebeck, Doyle, Bone Cave, Goodbars and Increase.

CHATTANOOGA, TENN.—E. W. Coleman, of Columbia, Tenn., has applied to the City Council of this place for telephone franchise.

SALISBURY, MD.—A new telephone line is projected to run from this place to Quantico and thence to Nanticoke Point, connecting at White Haven with the line from Princess Anne. John N. P. Insley is interested.

JANESVILLE, WIS.—Janesville Telephone Company has been incorporated, with a capital stock of $25,000.

New Electric Railways.

BUFFALO, N. Y.—The Buffalo & Lockport Railway Company, which will operate an electric line between Buffalo and Lockport, via Tonawanda, has been incorporated; capital stock, $1,000,000. The directors are: Burt Van Horn, H. J. Pierce, R. L. Fryer and George H. Dunbar, of Buffalo; J. A. Merritt, S. Curt Lewis and F. M. Ashley, of Lockport, and F. A. Dudley and W. Caryl Ely, of Niagara Falls. Among the other stockholders are Henry M. Watson, H. H. Littell and P. P. Pratt, of the Buffalo Railway Company.

CHICAGO, ILL.—Desplaines Valley Electric Railway Company has been incorporated—capital, $100,000—to construct railroad from some point in township of Lyons to point in city of Chicago. Incorporators and first board of directors: Nelson F. Merrill, Hiram A. Johnson. H. Wallace Perce, Chicago; Henry B. Fargo, Geneva, and Samuel S. Carman, Jr., Oak Park.

PENN YAN, N. Y.—It is understood that the project to construct an electric railway between this place and Geneva has been abandoned.

BLOOMINGTON, ILL.—Electric Street Railway Company has been incorporated by W. H. Beaver, J. W. Gray and J. Y. Chisholm, to conduct street railway; capital stock, $20,000.

ANDERSON, IND.—The Union Traction Company, constructing the Gas Belt Electric Railway, will immediately construct a line from Alexandria to Elwood, connecting with the Anderson and Marion line.

SENECA FALLS, N.Y.—The scheme to connect the city of Auburn and Seneca Falls village by electric railroad is once more being agitated.

EAU CLAIRE, WIS.—The Chippewa Valley Electric Railroad Company, with a capital of $200,000, has been formed here. It is understood it is to build and operate the interurban line and the Chippewa line and eventually own and operate the whole system, including Eau Claire. The Eau Claire system is still owned and operated by the Chippewa Valley Electric Railway Company. The officers are: President, N. C. Wilcox; vice-president, H. N. Bates; secretary and treasurer, A. E. Appleyard.

MIDDLEBORO, MASS.—The New Bedford, Middleboro & Brockton Street Railway Company have been granted a franchise for a plant.

CANTON, OHIO—Louis N. Ley, City Clerk, may be addressed concerning construction and operation of street railway route No. 3.

New Incorporations.

NEW YORK, N. Y.—Rousseau's Electrical Works, to manufacture apparatus and appliances for electrical purposes, has been incorporated; capital stock, $25,000. Directors: David Rousseau, of Borough of Bronx; I. M. Randolph Meikleham, John Sheafer Douglas, Charles H. Hart and Frederick W. Douglas, of Borough of Manhattan, New York city.

Patent Decision on Dynamo Winding.

Judge Coxe has just rendered a decision in the suit of Edison Electric Light Company vs. E. G. Bernard Company, et al., upon the Edison patent No. 264,668, for the compound winding of a dynamo, dismissing the complaint. The Edison patent is declared to be invalidated by the patent to Charles F. Brush, No. 217,677, granted to Mr. Brush for this same improvement some three years prior to Edison's patent.

The old Brush dynamos of 1878, built in accordance with his specifications, show completely satisfactory automatic regulation from no load to full load when running incandescent lamps of low voltage, such as are used at the present day in large cities for telephone exchange signals, where they are operated by compound-wound dynamos in all essential respects like the Brush compound-wound dynamos of 1878–79.

In fact, the Brush dynamos of 20 years ago can be put into operation where a modern compound-wound dynamo is used, without any modification or change whatever, so that, if the Edison patent were sustained, it would involve the enjoining of the use of dynamos built for the same purpose as that set forth in the Edison patent No. 264,668, and built four years before the date of his application. The opinion is very flattering in its commendation of Mr. Brush and his early work.

Notice to Advertisers.

There is great activity, particularly throughout the West, in electric power transmission, electric lighting, street railway construction, and the electrical industries in general. The ELECTRICAL REVIEW is read by every one assisting in this development. Manufacturers and dealers in apparatus and supplies can reach them through its advertising columns. Remember the Conventions of the National Electric Light Association and the Northwestern Electrical Association, which occur June 7-9, and June 10-14, respectively.

THE ELECTRICAL EXPOSITION.

(Concluded from page 323.)

set of portable and switchboard, direct and alternating-current Whitney and Hoyt instruments; exhibition switchboard made by the W. S. Hill Electric Company, New Bedford, Mass.; a collection of special and standard perfection dynamo brushes made by the Ohio Electric and Specialty Manufacturing Company, Troy, Ohio; some sample elements of storage batteries made by the Ohio Storage Battery Company, and sample carbons for enclosed arc lamps made by Hardmuth & Company.

A comparatively new adaptation in arc lighting is the great cluster of arc lights suspended in the center of the Exposition hall, with 40 lights of the "Mac Intire" system arranged in a graceful pendant. In size it is probably the greatest electrolier ever constructed as it weighs in the neighborhood of three-quarters of a ton, with an amount of light which equals 40,000 candles. On a pressure of 80 volts the lamps consume four and one-half to five amperes.

This unique electric pendant was designed personally by Mr. George R. Mac Intire. In addition to this feature, the company have quite a large representation of various forms of special lamps, which include ornamental post lamps at the Madison avenue entrance, one of the ornamental prismatic pendant type, a silver pendant lamp, two most artistic post lamps at the speaker's rostrum, one of the "Baby" type, weighing four and one-half pounds, the smallest arc lamp constructed, at the Exposition office of the ELECTRICAL REVIEW, and a number of other adaptations, which, taken altogether, make the Mac Intire exhibit an interesting one in the way of arc lighting.

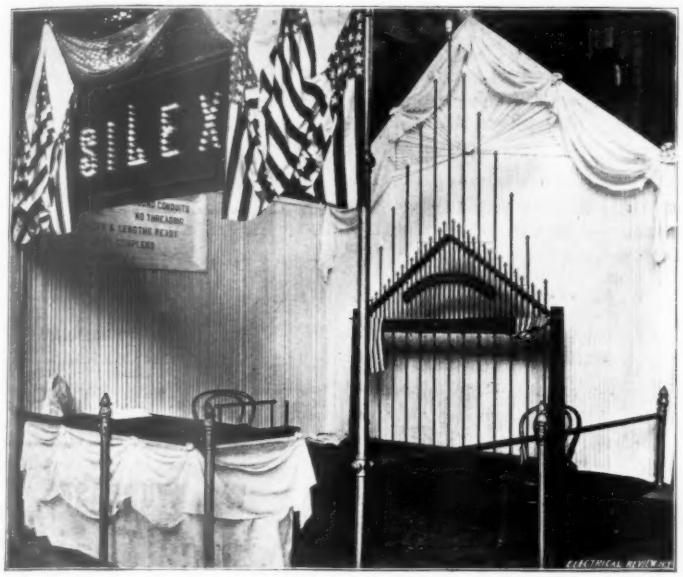


EXHIBIT OF THE SILEX COMPANY, AT THE ELECTRICAL SHOW, NEW YORK.

The conduits made by the H. B. Camp Company, Aultman, Ohio, are exhibited in several ways at the exposition. The company have an artistic booth filled with the different specimens of the conduit, including all the characteristics of street ducts, curved pieces, elbows and tees, and split ducts used in repairs. In the making of the latter, a channel is cut on either side, so that when it is desired to make repairs, the portion can be detached by merely striking the duct. The material from which the "Camp" conduit is made is clay peculiar to a certain section of Ohio. Mr. A. L. Daniels, the sales agent for the company, is in attendance at the exposition, and Mr. Camp, the son of the inventor of the conduit, who is in New York at this time engineering the laying of their conduit for a large section of the Metropolitan Street Railway.

The Silex Insulation Company, 39–41 Cortlandt street, New York city, exhibit a new conduit wrought out on a new principle of insulation. The construction of the conduit is an inner and an outer smooth metal tube, in the space between which there is packed silex to a solidity approaching the solidity of the rock from which it is ground. Protruding and receding mica wads in each end of the tubes form the insulating ends of the tubes, which are connected together with a right and left coupler, furnishing a smooth-bore, metal-lined, insulated conduit, the insulation of which is completely continuous. Neither heat nor shock can affect this insulation; it is pre-eminently an unchangeable insulation. The rubber can be burned off, and the copper conductor wires melted out of this tube without affecting the conduit, new wires can be immediately drawn through it. The principle upon which this conduit is constructed is the introduction of insulating materials, the particles of which are free to move relatively, which is the production of the flexible mineral insulator.

Annual Meeting of the General Electric Company.

The annual meeting of the General Electric Company was held in Schenectady, N. Y., May 10, and 210,000 shares were represented.

The following directors were elected: Gordon Abbott, Boston; Oliver Ames, Boston; C. A. Coffin, New York; T. Jefferson Coolidge, Jr., Boston; C. H. Coster, New York; Thomas A. Edison, Orange, N. J.; George P. Gardner, Boston; Eugene Griffin, Ardsley Casino; F. S. Hastings, New York; Henry L. Higginson, Boston; J. Pierpont Morgan, New York; Robert Treat Paine, second, Boston, and George Foster Peabody, of New York.

Besides the usual routine business the following resolution was adopted:

Resolved, That the interests of the stockholders require that any proper or necessary adjustment of the impairment of the capital of the company should be promptly made, with a view to the early resumption of dividends.

It is reported as the general opinion among the directors that the proper adjustment would be to scale the stock by one half, and such a scheme will probably be presented to the stockholders for their consideration in the near future.

New York Electrical Society.

The second lecture of the Society's Electrical Exhibition Series will be given in the concert hall, Madison Square Garden, on Thursday the 19th, at 8.30 P. M., by Prof. I. Fujioka, of the Imperial University, Tokio, Japan, on "Electricity in Tokio and the Kingdom of Japan."

FOR SALE . . .

One 150-h.-p. Single-Cylinder Ball & Wood Engine, 16 x 16, 250 R. P. M. In first-class condition.

Two 60-k.-w. Edison Bi-polar Dynamos, in A No. 1 order.

One 60-inch 3-ply Leather Belt, 96 feet 0 inch long. Run but a short time.

For further particulars, address
J. F. OUTWATER,
360 Pearl Street,
Brooklyn, N. Y.

A BARGAIN.

We have for sale a 25 horse-power horizontal engine (Nagle, Erie, Pa.) and boiler for same; only used a short time; good as new. Will be sold low.

Address A. H. Potts & Co.,
Parkesburg, Pa.

IRON ROOF FOR SALE.

Dimensions of building—87 ft. in width, 225 ft. in length, one story in height; side walls and gables of brick; building designed for a machine shop, but, owing to the failure of the purchaser, the iron roof trusses are now offered for sale at a bargain. The roof is admirably adapted for a machine shop, car barn, paper mill, or for any other general manufacturing purposes.

Apply to
THE BERLIN IRON BRIDGE COMPANY,
EAST BERLIN, CONN.

WANTED.

Position, by an electrician. Familiar with electric street railway work and telephone work. Good references furnished.

Address "A. W. K.,"
care Electrical Review, N. Y.

WANTED

A responsible concern to handle and sell a Metallic Gutter for street cars, drained by tubular spouts running down the uprights, disguised as hand rails. Should be applied to every open street car. (Device patented.)

CHARLES A. MANN,
BANGOR, ME.

Bargains in Dynamos, Engines, Etc.

Direct-current dynamos of 350, 700, 725, 800, 810, 900, 1,075, 1,350, 1,610 and 2,500 light capacity.
Alternating-current dynamos of 750, 900, 1,300 and 2,000 light capacity.
Arc dynamos, 20, 24, 30, 40, 50 and 60 lights, both 1,200 and 2,000 candle-power.
Engines, 50, 75, 85, 100, 115, 125, 150, 175 and 200 horse-power.
Boilers, 100, 250, 375 and 500 horse-power.
Heaters, 150 and 2,000 horse-power.
Pumps, all sizes.

Write us for Price-list No. 21.

This apparatus has been removed from our own Central Stations to make room for larger units. We therefore know its history and can guarantee it to be in thoroughly good operative condition.

CHICAGO EDISON COMPANY, 139 Adams St., CHICAGO.

Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED DATE OF MAY 4, 1898.

603,624 603,625 Electric railway; E. C. Crocker, Bridgeport, Ct.

603,630 Electric arc lamp; F. A. Gilbert, Brookline, Mass.—In an arc lamp, a globe having a removable cover, through which the carbon passes, and means to lift the cover and retain it lifted from the globe for trimming, the cover when lifted engaging and holding the upper carbon stationary.

603,650 Automatic electric feed-water regulator; A. E. Maccoun, Braddock, Pa.

603,665 Control apparatus for elevators; A. Sundt, New York, N. Y.—In an elevator control device, the combination with the motor and working circuit therefor, of local circuit operated from the car or floor, and a non-interfering locking device operated by a local circuit and released by the motor.

603,681 Throw-off switch for telephones; N. Fallek, San Francisco, Cal.—The combination with a pivotally attached switch lever; of a spring, a ratchet-toothed bar, a sliding dog, spring arm, a pivoted lever, a pivoted piece on the end of said lever and the arm on the telephone hook having inclines on the end to engage the inclines on the said piece.

603,687 Electric-arc lamp; J. H. J. Haines, New York, N. Y.—The combination with the tilting clutch and the nicked rod, of a plate carried on the said crutch, and adapted to fit into the nick.

603,696 Automatic temperature-regulating apparatus; W. B. Loring, Worcester, Mass.—In a motor operated by electricity, the combination with a shaft adapted to revolve in either direction, and to be positively stopped at the end of a predetermined movement, and a gear or pulley loosely mounted on the said shaft, but connected therewith to turn said shaft, of a switch or switch mechanism.

603,705 Electric incandescent lamp; W. J. Phelps, Chicago, Ill.

603,709 F. Schwedtmann, St. Louis, Mo.—In a dynamo or motor, a suitable casing or housing for the field-magnet core cast in one piece, a laminated field-magnet core inserted in said casing from the bottom, and means for rigidly securing said core in said casing.

603,722 Electric condenser; C. S. Bradley, Avon, N. Y.—An electric condenser having a dielectric stearage of lead.

603,778 Starting device; J. P. Stone, Schenectady, N. Y.

603,786 Electrically controlled switch; E. M. Hewlett, Schenectady, N. Y.—In a switch, the combination of fixed contacts, solenoid magnets, a toggle acted upon by the magnet core, contacts actuated by the toggle, and a spring acting on both sides of a dead center and connected with the toggle.

603,815 Electro-therapeutic apparatus; G. G. Duke, Chicago, Ill.—An open-ended casing provided adjacent to its open end with a perforated diaphragm, with an inlet-tube opening into said receptacle behind said diaphragm, and with an outlet-tube leading therefrom between said diaphragm and the outer margin of the casing.

603,849 Switch for electric motors; F. E. Herdman, Winnetka, Ill.

603,875 Electrical apparatus for schools; M. E. Crowell, Indianapolis, Ind.

603,876 Electric headlight; F. W. Dressel, New York, N. Y.—In a headlight, a ring secured within a car-dash, ring being wider at the bottom than at the top, in combination with the body of the headlight hinged to said ring.

603,882 Electric lantern; F. G. Adams, London, England.—In an electric lantern, the combination with a casing having partitions, of blocks at the bottom of the casing electrodes, with insulating stops, wedges for securing the electrodes, an overlapping cover provided with a metallic strap, contact pegs, conductors and a sliding front covering the conductors and carrying the lamp and fittings.

603,883 Safety incandescent electric lamp; F. G. Adams, London.—An electric safety lamp, consisting of the lamp proper, which is provided with a glass chamber enclosing the lamp and joined thereto by the fusion of the glass, and an automatic circuit chamber, becoming active upon breakage of the enclosing chamber.

603,886 Electric steering apparatus; H. O. F. Bindemann, Madrid, Spain.

603,898 Alarm; I. B. Frazee, Blairstown, Iowa.—The combination of a magnet, an armature arranged in front of the same, a device acting upon the armature for opposing the attractive influence of said magnet on its armature, and a steadying device acting against the armature and holding it in plane of the neutralized forces.

604,001 Typewriting machine, etc.; T. Cahill, New York, N. Y.—In combination with suitable character-corresponding devices, permutational selecting mechanism, having a plurality of controlling elements, and a motor device, serving to actuate a plurality of the controlling elements before mentioned, each as required.

With the Navy.

One of the Naval Reserves who went forth from the electrical field finds life on board a United States cruiser quite entertaining. He writes to a friend as follows:

"Been working like the devil, handling heavy boxes of ammunition and stores—in fact, am now writing on top of a box of six-pound shells to be used in target practice, probably, for I don't know when we will see any Spaniards. Everything is in confusion around me and they are constantly yelling for me to bear a hand, consequently am writing this in relays. Spent all day yesterday loading ammunition in magazines, about six miles below deck! Am dirty as a scullion and never expect to get clean again. Our probable destination is Newfoundland, and if so I see my finish, as I came prepared for southern waters, not Greenland. Am roused out at 5 A. M. each day to swab down the deck. Great fun! Speaking of work, I never saw such a thing before. Tell G——— I could keep his yacht clean with one hand now and forget I was doing it. Excuse dirt and this pencil. No pens to be had, as all our clothes, etc., are in canvas bags."

Creditable Showing in Street Railway Motors.

Seventy-six double equipments of type 49, 35-horse-power motors, have been ordered from the Westinghouse Electric and Manufacturing Company by the Cleveland Electric Street Railway Company. Westinghouse street railway motors have achieved a degree of success that has made them standard. Mr. Charles H. Smith, superintendent of the Lebanon & Annville, Pa., Street Railway Company, writes:

"On June 20, 1895, one of the Westinghouse 12-A, 30-horse-power equipment was put into service on this road. Since that time it has made 592 days, 200 miles per day, a total mileage of 118,400, without a single repair to any part of the machine, save renewal of brushes and bearings. The motors were put under a Jackson & Sharp 30-foot closed-body car, running over the hardest part of our road, with less than five minutes' lay-over at either terminal, from 6 A. M. to 12 midnight."

The office of the Electric Arc Light Company, Mr. J. H. Hubbard, sales agent, will be in future at 120 Liberty street, New York city.

J. G. WHITE & COMPANY,
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ENGINEERS, CONTRACTORS,
29 BROADWAY, NEW YORK, N.Y.
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Electrical Engineers THE CROSS ELECTRICAL COMPANY, Special attention given to the designing of central stations and isolated plants.
CROSS ELECTRICAL COMPANY,
305-307 Mooney Brisbane Building, Buffalo, N. Y.
Our Factory for Refilling Incandescent Lamps will soon be ready. Telephone, Seneca 1277.

THE AKRON INSULATOR AND MARBLE COMPANY,

MANUFACTURERS OF
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HIGHEST GRADE INSULATORS AND ELECTRICAL CLAY SPECIALTIES OF ALL KINDS.
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For our free book, entitled "Can I Become an Electrical Engineer?" address
The Electrical Engineer Institute of Correspondence Instruction,
CONDUCTED UNDER THE AUSPICES OF "*THE ELECTRICAL ENGINEER.*"
Herman A. Strauss, E. E., General Manager. 120 Liberty Street, New York, U. S. A.

Kindred.... ...Interests

The Weston Engine Company, Painted Post, N. Y., are extremely busy turning out their engines to new and old customers.

The Rochester Electric Motor Company, Rochester, N. Y., have just issued a very artistically designed prospectus illustrative of their new series, type "A," dynamos and motors, built in sizes from one-quarter to 25 horse-power.

The Electric Storage Battery Company, of Philadelphia, has closed a $150,000 contract with the government for batteries to be used in torpedo boats. Recent contracts with the government for mines, etc., amount to $250,000.

The Wilhelm Telephone Manufacturing Company are now installed in their new factory in the Caxton Building, Buffalo. This company has been for some weeks equipping their shops in this building, and now are splendidly equipped with a much larger working force.

The Kokomo Telephone and Electric Company, Kokomo, Ind., of which Mr. J. P. Hutchings is secretary, is rushed with orders for telephone work, and is devoting 16 hours a day to business. This company makes a very popular and high-class telephone and accessories, and is meeting with the success that such work deserves.

The Electric Novelty Manufacturing and Construction Company, Richard J. Ward, manager, located at 116–118 Green street, Brooklyn, is forwarding an interesting pamphlet to its friends, illustrated with old-style cuts carrying the following motto: "We have started on the road to discovery and will not stop until we have startled the world." This company manufactures its own specialties, such as Ward's patent door opener, door stop, circuit-breaker, portable burglar alarm, etc.

The Columbia Incandescent Lamp Company, of St. Louis, reports a constant and large increase of business during 1898 as compared with the previous months of 1897. This incandescent is one of the best known, and its popularity is the result of the high grade quality that has ever been maintained in its manufacture. The Columbia has branch offices in New York at 1311 Havemeyer Building, in Chicago at 1236 Monadnock Building, and in San Francisco at the Paul Seiler Electrical Works.

The Sprague Electric Company, New York, has just received a contract for seven worm-gear drum elevator machines for the Government Printing Office at Washington, D. C. A significant fact is that one machine of this type was ordered two years ago, and the satisfactory service that it gave led to the second order. The foreign market for American electrical machinery seems to be opening up in a very satisfactory manner. The Sprague Electric Company have recently shipped several direct-connected generating sets for isolated lighting plants, as well as a large number of Lundell fan motors to India and Japan. A firm of electrotypers and stereotypers in Berlin, Germany, has recently been fitted out by F. Wesel & Company, of New York city, with an up-to-date plant. Every machine run by power has its own separate Lundell electric motor, and the motors were supplied by the Sprague Electric Company, of New York. It is said that this is the first and only plant of this description in the world at the present time, operated in this way, and it will no doubt attract a great deal of attention here as well as abroad.

Quick-Break Switches.

If you desire the best, latest and most improved quick-break switch on the market, get the

"DEMARY."

They are all made of the best material that can be obtained, and all parts are standard in size.

These switches are made in one grade only, highly polished and lacquered.

Send for Catalogue and Prices.
They will interest you.

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133 Erie County Bank Building. BUFFALO, N. Y.
MARYLAND AGENTS:
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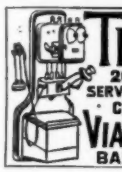
C. L. MEES, President, Terre Haute, Ind.

CROFTON STORAGE BATTERY CO.
J. K. PUMPELLY, Manager.
VERY LIGHT BATTERIES
A SPECIALTY.
327 DEARBORN STREET, CHICAGO.


THIS CO HAS BEEN MAKING
TELEPHONES
20 YEARS, NOT CHEAP BUT SERVICEABLE AND FULLY GUARANTEED.
CIRCULARS FURNISHED.
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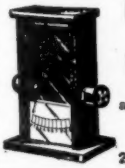
BALTIMORE, MD., U. S. A.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VOLTMETERS,
Like cut, reading from 0 to 10, at $1.50 each. 0-25 at $5.00 each.
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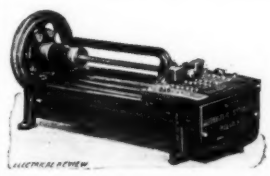
EDWARD S. DUVALL,
Solicitor of Patents,
Counsellor in Patent Causes.

Some time connected with the late Benjamin Butterworth, before he retired from practice to assume the office of Commissioner of Patents.

Prompt attention given to all matters before the Patent Office, and applications for patents prepared here at Washington from sketches, photos, or models, in a manner to give highest satisfaction and with less expense than you will incur elsewhere. Write and convince yourself of this fact. As an attorney at Washington is indispensable you can save the expense of having two by communicating directly with me.

LOAN AND TRUST BUILDING,
WASHINGTON, D. C.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Engineers and Contractors

Desiring a thoroughly reliable Automatic Starting Apparatus for electric pumps, elevators and other intermittent work, can not do better than send for our catalogue of Motor-Driven Starters and Specialties. No dash-pots, shunt magnets or other delicate mechanism, yet automatic start and instantaneous release under all conditions.

Automatic Switch Co., Baltimore, Md.

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PARTRICK, CARTER & WILKINS 125 So. 2nd. St. PHILA. **MANUFACTURERS AND DEALERS**
GENERAL ELECTRICAL SUPPLIES

"ELECTRICITY AT THE COLUMBIAN EXPOSITION."

A Chance to get an Interesting Book at Small Cost.

It is now nearly four and one-half years since the close of the great World's Columbian Exposition, held in Chicago. Every vestige of the famous electrical display at which the people gazed and wondered has disappeared. The people have gone, the buildings have been removed, the drives and walks changed and the Exposition grounds once more transformed into a beautiful park.

Electricity at the Columbian Exposition, however, lives not only in the memories of the people who have seen it, but also in a more substantial form in the shape of a five-hundred-page book compiled by John P. Barrett. This book, "Electricity at the Columbian Exposition," contains eighty-four handsome full-page illustrations, sixteen of which show exterior views of the buildings at night. The brilliant illumination of the buildings by both incandescent and arc lights made it not only possible to photograph them after nightfall, but also gave unique and artistic results. Seventeen of the full-page illustrations are general views giving pictures of the fountains and statuary, and there are also fifty full-page pictures of the various exhibits.

The paper used in this book is finely finished enameled book paper, which allows for the best effect in printing illustrations. The text is generally descriptive of the various exhibits and of the buildings, and also contains several reports of the expenses and the operation of the intramural railway, and several short historical introductions to the descriptions of the various departments of electricity.

The price of this book, bound in cloth, is $1.00. It is supplied by the

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A Neat Advertising Idea.

Among the many quaint and curious ideas developed by the advertisement maker, the one illustrated herewith seems particularly attractive and

efficient. It is used to advertise a well known make of fan-motor, and the way in which the vessel scuds along under the breeze of the windmaker should convince any one that the power of the fan is stronger than many suppose.

The regular quarterly report of the Niagara Falls, Whirlpool & Northern Railway Company for the quarter ending March 31 shows: Gross earnings, $570.50; operating expenses, $861.21; net loss, $299.71; gross loss, $290.71; fixed charges, $346.25; deficit, $636.96. The regular report of the Niagara Falls & Suspension Bridge Railway Company, for the quarter ending March 31, has been filed with the State Railroad Commission. The report shows: Gross earnings, $13,602.38; operating expenses, $8,603.41; net earnings, $4,998.97; other income, $3,256.43; gross income, $8,255.40; fixed charges, $9,370; deficit, $1,114.60.

Interesting Scientific News from Abroad.

A 10,000-Volt Transmission Plant, W. Klug—This is a description of the three-phase plant between Eichdorf and Gränberg. The power is developed at a voltage of 225, transformed up to 10,000 at Eichdorf, and down to 120 volts at a single step at Grünberg. The transmission mains consist of bare copper wire 25 square millimetres in section in the intervening country, and of the same size as india-rubber insulated wire when entering the towns. The lines are throughout protected by lightning protectors—one for each line wire. The spark-gap is between bent copper strips held on high-pressure insulators. The line is connected to one of these strips and the other is connected to earth. As a further protection from lightning, a barbed wire runs above the line, being fixed to the tops of the poles and earthed at every sixth pole. Experience shows that this system of protection from lightning is efficient.

Accumulator Traction at Ostend, E. Piérard—The cars are constructed to carry 50 persons, with seats (inside only) for 24. The weight, unloaded and without accumulators, is 7½ tons. That of the accumulators is not given; but it is to be inferred that the weight somewhat exceeds 2½ tons. The truck is carried on four wheels, and is furnished with two 18-kilowatt Westinghouse motors, coupled to the axles by single-reduction gearing of 1.5. The battery consists of 108 cells contained in 12 boxes, which appear to be placed beneath the seats. The capacity amounts to 140 ampere-hours at a discharge of 50 amperes. The time required for charging varies from ¾ to 2 hours according to circumstances, the necessary current being supplied by a steam belt-driven Westinghouse dynamo. All active material falling from the positive plates is carefully collected and reapplied from time to time. Up to the present, the running expenses have been low. The coal consumed amounts to 5.1 pounds per car mile, and the tractive force is said to vary from about 18 pounds per ton at starting down to 9 pounds at a speed of 11 miles per hour on Vignole rails.

Ambroïne. J. A. Montpellier. (Électricien, 15. pp. 17–19, 1898.)—"Ambroïne is a new insulating material; it was manufactured in the first instance in Germany, but works have recently been installed for it in France. Resin, mica and amianth are part of its composition; these are carefully ground and mixed, and are then submitted to chemical treatment. Finally, the mixture is heated under pressure. The properties claimed for ambroïne are: 1. That it can be moulded into any form with but small loss of volume, leaving a surface smoother than ebonite under like conditions; this surface is said to be brilliant and polished; working parts of objects moulded in it are said to fit rigorously if the moulds are right. 2. It is claimed to be an excellent insulator; a sheet 0.34 millimetres withstands 5,000 volts; a rod one centimetre diameter and 25 millimetres long, after 24 hours immersion in water, has 290 megohms, or, after drying, 1,000 megohms. 3. It is not affected by light, and is only slightly absorbent of moisture. 4. It resists acids, and is not easily affected by heat or boiling water. 5. It is claimed to be about twice as strong mechanically as ebonite; it has also greater resistance to compression. It is made in five qualities for special purposes; i. e., one quality that resists the boiling water, a second that holds out against the 5,000 volts, a third that withstands the acid, and so on. Particulars as to the quality of the various materials with which ambroïne was compared are omitted; so also are the methods of testing.

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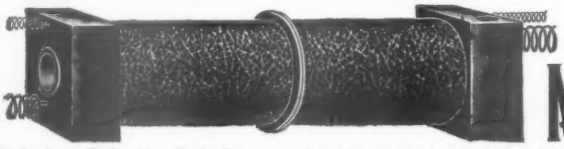

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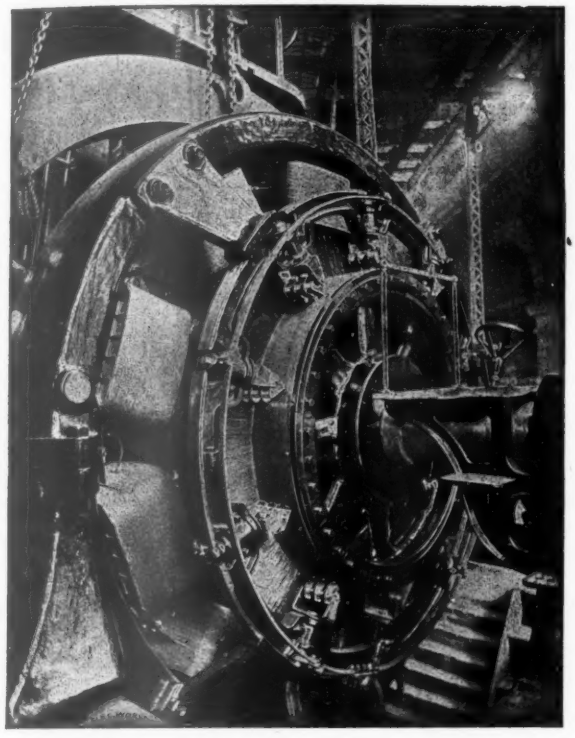

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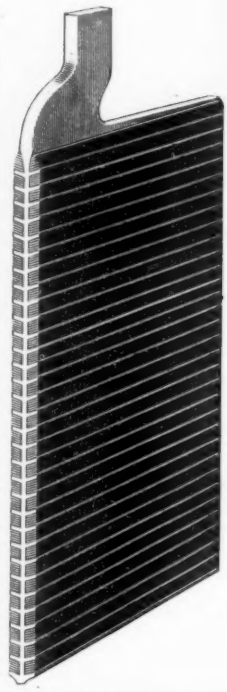

What we claim for the Willard battery is, that its mechanical and electrical construction is so obviously correct that any one familiar with storage batteries of the past and present and their hereditary defects can determine at a glance that all such defects are provided against, and that it is built on lines in such harmony with the inexorable laws of Nature as will insure harmonious action of the parts and consequent long and serviceable life. While we claim electrical superiority in the Willard plate, yet we maintain that the greatest faults of past and present batteries lie in their mechanical construction, and so great are these errors and so general are they, that you will find it difficult to find a storage battery that has lived to a ripe old age and gradually worn out in a theoretically natural way, while the generality will be found to have met with a violent death at an early age, which is directly attributable to their mechanical construction.

The rigid supports in all various styles and shapes lead in promoting havoc, and all of the numerous cases of violence to self is directly due to such like attempts to restrain Nature. The broken supports, shelves, grids, receptacles and pellets, the bending, buckling, warping, and other distortions of the plates, pellets and parts are all the progeny of mechanical restraint. Consequently, one of the greatest features of the Willard plate is its provision for the laws of Nature. Sufficient room is left for the expansion and growth of the active material, and any disposition to restrain Nature is entirely absent; on the contrary, Nature is a full partner in the Willard plate. While other plates are vainly attempting to prevent the expansion occasioned by the electric action and the growth of the active material, and making such poor success as to gradually become more distorted and less recognizable, the Willard having provided for and invited the assistance of Nature, improves with age as the active material increases and only ceases to perform its functions when, after a long period of time it has in a natural way, gradually worn away.

We show on this page a cut of the Willard Plate, which will exhibit its construction. It is made from a single piece of pure rolled lead, of the same original thickness throughout. The thin leaves or shelves that you see are integral with the web or support; they are a part of the original plate of lead, and have never been detached therefrom; the angle of the leaves admit of the expansion and growth of the active material, with no ill effects whatever to the plate.

If the reader will call to mind all of the defects in storage batteries that his experience has developed and trace each one back to its source, and compare the troublesome feature with this plate, we think he will find the same is entirely overcome.

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